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VOLUME XX | JUNE 22, 1931 | NUMBER 12

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Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

Volume XX | JUNE 22, 1931 | Number 12

Spectrophotometric Measurements in The Dyestuffs Industry*

By CARL Z. DRAVES

E. I. du Pont de Nemours & Co., Inc.

In this article Mr. Draves discusses the use of spectrophotometric measurements in the dyestuff field. He emphasizes the fact that mechanical methods should not be substituted for personal accuracy to too large an extent. He further discusses when it would be advisable to use spectrophotometric apparatus and when it would not be.

WE are met here to discuss the measurement of color and the use of color-measuring instruments in industry. I shall endeavor, as my part of the discussion, to point out how spectrophotometric measurements are useful in the manufacture, standardization, sale and use of dyestuffs. I shall also endeavor to point out those purposes for which direct visual examination is more advantageous than the spectrophotometric method, for there are some who, in their enthusiasm, would employ a spectrophotometer for purposes which can be accomplished more simply, quickly, cheaply, and just as satisfactorily without an optical instrument.

If I seem to be rather reactionary in my attitude toward certain phases of spectrophotometry, please remember that I am trying merely to keep my feet on the ground at a time when so many want to jump at the prospect of replacing personal knowledge, experience, skill and visual acuity in color discrimination by automatic machines for the selection of dyes and the matching of colors. It seems to me from my contact with numerous inquiries which reach our Company from consumers of dyes—and they come from a great diversity of industries—that there is an over-emphasis with regard to the possibilities of spectrophotometry for commercial purposes at the present time, just as we have overemphasis of so many things in a progressive age. To counteract any implication, however, that I may be unsympathetic with the use of the spectrophotometer may I be excused if I say that I was responsible for the adoption, five years ago, of the spectrophotometer as an aid for routine testing and for research by the only dyestuffs manufacturer in America, who, up to the present time, has made any extensive use of a spectrophotometer. In this work I was merely following the way which had been so thoroughly blazed by our United States Bureau of Standards.

Spectrophotometric measurements have proven useful to our Company, both for routine testing, and for research. But the appreciation of this usefulness has not come in a week, or in a month, or even in a year to those who might use the results. It should be realized that it requires time for the spectrophotometric method to prove its value and to be appreciated by plant and research chemists. Only those methods can survive in industry which, after thorough trial, are found to give the most useful results at the least expense.

It was in 1926 that the du Pont Dyestuffs Department first adopted the spectrophotometric method of testing dyes in solution for the routine standardization of commercial lots of dyestuffs for strength. Although the usefulness of the spectrophotometer for this purpose has been pretty well covered in a paper which was presented before the American Association of Textile Chemists and Colorists[1], it is appropriate to give a few generalizations upon that topic here and now.

If commercial dyes were chemically pure substances containing no colored impurities and never were shaded, but were merely diluted with salt or some other colorless substance, then the spectrophotometric method for the determination of strengths would be sufficient in itself. Since, however, only some dyes are what might be termed chemically pure and since the proportion of colored impurities and the proportion of shading color—if any—and the affinities of these things for the fiber may

*Presented before the Optical Society of America in New York City on February 26, 1931.

vary, it is evident that the sypectrophotometric method of testing dye solutions for the determination of strength must remain secondary and auxiliary to the dye test. In practice it has been found that the usefulness of spectral data for strength determination, or, to put it in another way, the relative concordance of actual dyeing strength and the spectral strength of the solution, is dependent upon the uniformity of production of the dye. In our own plant so much progress has been made in improving the quality of intermediates and in stabilizing processes over the past five years that the present agreement between actual dyeing strength and spectral strength is really remarkable. On the other hand, when we come to compare samples of our present production with our own production of seven or ten years ago, or to compare our dyes with dyes made by other manufacturers under different conditions, the concordance between spectral absorption figures and actual dyeing strengths is not so good. We see, therefore, that it requires judgment and constant experience with a given type of production of a dye by those responsible for standardization to make the best use of spectral absorption data as an aid in turning out successive lots of dye which have exactly equal dyeing strength for a given kind of fiber.

Formerly, we employed the titanous chloride titration method of analysis wherever it was applicable as an auxiliary method for the standardization of dyes for strength. That method was gradually and completely displaced, however, until now it is used only for the analysis of intermediates. The reason for the abandonment of the titanous chloride titration was that the spectral method is quicker and easier, it can be applied to many more dyes and for commercial dyes the spectral strength more frequently checks the dyeing strength because colored impurities have less effect on the spectral absorption value than the principal dye component. It may be said, therefore, that the estimation of a value to represent the dyeing strength of a commercial dye without making a dyeing can be made more accurately from a spectrophotometric examination of a solution of the dye than from a titanous chloride titration of such a solution. Although the precision, or reproducibility of results, is better with the chemical titration, the dye manufacturer is more interested in an accuracy of 1% than in a precision of 0.1%.

Any dyes which can be brought into clear solution can be satisfactorily tested by the spectrophotometric method. As a solvent for direct and acid dyes we employ distilled water with 25 c.c. of a half molar acetic acid-sodium acetate mixture as a buffer because water is less expensive and easier to work with than other solvents. Mr. W. C. Holmes has recommended 90% alcohol for routine work[2] because the use of alcohol avoids anomalous concentration effects and because the basic dyes in alcoholic solution do not tend to stick to glass surfaces. However, within the differences in strength encountered among commercial dyes, Beer's law is sufficiently valid with aqueous solutions and the basic dyes can be kept from sticking to glass surfaces by the use of acetic acid in solution with the dye. The free bases of the basic dyes are dissolved in strong acetic acid and the spirit soluble dyes with denatured alcohol. In a few instances, benzol or gasoline is employed. The vat colors are dissolved in concentrated sulfuric acid when they do not contain carbonizable material, such as sugar. Although satisfactory results can be obtained with the sulfur and vat dyes which have been vatted in the same manner as for dyeing, we do not ordinarily determine, spectrophotometrically, the strengths of dyes which need to be vatted because the time and labor involved in bringing them into solution make the cost of a determination too high for use.

It is important in the determination of the strengths of commercial lots of dyes with a spectrophotometer to use methods which are very simple and at the same time foolproof so that, although the cost is low, great reliance can be placed upon the results, even when the tests are carried out by non-technically trained help. For the simplification of calculations, the Keuffel and Esser Color Analyzer employed in our work was specially calibrated in logarithmic units because dye concentrations are proportional to logarithmic readings. Furthermore, the size of the original weighing and the size of the aliquot portion taken for second dilution are so regulated that a reading of approximately 1.00 in logarithmic units is obtained because readings of absorption can be made most accurately at about 1.0 and also because calculations are simpler under those conditions. Although some consideration at first was given to the possibility that it would not be necessary to make and re-run a solution of the standard prototype each time an unknown strength was determined, it was finally decided that the gain in assurance and accuracy far offsets the slight additional work involved in re-running the standard. When the standard is re-run each time, the accuracy of the relative strength of an unknown in terms of the standard is not influenced appreciably by a slight error in the adjustment of the instrument. Besides, any gross error in weighing is caught up instantly because, if a reading close to 1.00 is not obtained for the standard, then a wrong weight must have been taken in weighing both standard and unknown.

For quick and easy work with dye solutions the type of cell is very important. Screw end cells are strongly to be condemned in spectral absorption measurements because with them it is too easy to encounter errors from squeezing dirt into the solution when the ends are screwed on. Adam Hilger of England offers for sale a cementless glass cell with open top which is certainly a very great convenience. This type of cell really saves hours of work each day because it is so easily filled and because the faces are so easy to keep clean.

Another important point in connection with the spectral absorption measurements of dyes for strength is that comparisons of strength can be made so much more quickly by reading each dye solution only at the maximum of absorption that it is a great waste of time to read the whole absorption curve. Furthermore, readings taken at the maximum of absorption actually check the dyetest better than the areas under the complete absorption curves. I can not agree, either practically or theoretically, with those who have recommended reading the whole curve[3].

The reproducibility of results in the determination of the strength of a sample of dye in comparison with a standard by the spectral absorption method is quite satisfactory. When the maximum of absorption is from 480 to 660 millimicrons we attain an accuracy which corresponds to an average deviation of about ½%. For yellow dyes which we arbitrarily read at 455 or 460 millimicrons, the average deviation of a strength determination is about 1%. Although our Keuffel and Esser instrument was specially designed to give greater illumination for transmission measurements, we really need another instrument which would give us greater intensity of illumination in the violet. The slit width of our instrument is 0.25 mm.

Although it is true that the relative hue of a charge or lot of dye in comparison with standard can be more or less determined by a comparison of the complete spectral absorption curves of the solution, or more simply still by a comparison of readings about 50 to 75 millimicrons on either side of the maximum, we have found it quite impractical to determine the relative hue with a spectrophotometer in the routine standardization of dyes. The exact color of a lot in comparison with a standard can be determined so easily and quickly by direct comparison of dyed skeins that it is really ridiculous to attempt to determine the relative color from spectral absorption measurements of solution of standard and lot.

Theoretically, the proportion of two known dyes in a mixture can be calculated from the spectral absorption curve of the mixture. Practically, however, we doubt if the method will ever be of anything more than theoretical interest because, first, too much work is involved in fooling with such determinations; second, slight errors or slight amounts of impurities introduce a relatively large error; and third, the correct result can be obtained without question by a series of dyeings. On the other hand, however, when the proportion of two or three dyes in a mixture has been determined from dyeings, a spectral determination of the strength of the mixture in solution has some value.

It frequently has been suggested to us that the spectrophotometer be used for the examination of dyed skeins or dyed piece goods for accurate estimations of the dyeing strength and relative color of samples of dye in comparison with standard. (The dyer always uses the term "shade" when he means "color".) Anyone who has seen a dyetester at work, however, will realize at once how impractical it would be for routine work in dye comparisons to examine dyed material with a spectrophotometer—even with the automatically recording types. The dyetesters would have a record of the color and strength of the lot in comparison with standard before the spectrophotometrist could even have the sample mounted for examination. The dyetester can make up his mind in one minute how strong the lot is, and how far off "shade." Furthermore, from long practical experience he can tell in a few seconds how much "shading" color is required to make the lot like standard, or whether to mix, let us say, a charge which is redder than standard with a charge which is greener than standard to obtain a lot of blue dye exactly like standard.

Both in the daily newspapers and in the scientific journals the statement is so often made that small differences in color can be distinguished much better with a spectrophotometer than by direct observation with the human eye, especially with those spectrophotometers which contain photoelectric cells. Such statements which are made without any quantitative consideration whatsoever of the sensitivity of the human eye to differences in color should not remain unchallenged. When a piece of wool was dyed with 1% of Du Pont Tartrazine O on the weight of the fiber, a full, rich, bright yellow was obtained. When a series of dyeings was made with the same amount of yellow and with increasing amounts of the bright red dye, Du Pont Crocein Scarlet Concentrated, it was found that 1/5000% of the red could be quite definitely distinguished with the yellow because it made the yellow dyeing slightly redder in hue, whereas 1/10000% of red was not always definitely distinguishable. The reflection of the piece dyed with the same amounts of the yellow dye and with increasing amounts of the red dye (none, 0.0001%, 0.0002%, 0.0005%, 0.001%, 0.002%, 0.005%, 0.01%, 0.02% and 0.05% of red dye), was measured at 510 millimicrons where the red has the most effect on the reflection. These reflection values were then plotted against percent of red dye. By drawing a smooth curve through the points it was possible to calculate, from the slope of the curve near the origin, the effect of 0.0002% of red on the reflection value at 510 mu., even though the difference in reflection for such a small amount of red was smaller than could be determined directly with the spectrophotometer. It was found in this manner that 0.0002% of red dye, the effect of which on the hue of the yellow was definitely distinguishable with the naked eye, caused the reflection at 510 mu. to decrease from 22.908% to 22.898%, or by 0.01%. The effect of the red dye on the reflection in other parts of the spectrum we know was much less because that particular red has the most effect at 510 mu. We see, therefore, that if the difference in hue between the two dyed samples had been determined from spectral reflection measurements, it would have been necessary to have had an absolute accuracy throughout the whole spectrum of 0.01% in reflection to have accurately defined each color. The width of a line on a scale on which 10% is ½ inch would be at least 0.2%. From

these sketchy figures it can be appreciated how difficult it would be for an automatically recording spectrophotometer to distinguish the slight differences in color which are evident to the dye. And in stating these conclusions we have omitted to mention that an observer is able to appreciate the color of a fabric with the naked eye regardless of slight and local variations in the gloss and in the structure of the fabric, factors which markedly affect spectral reflection values.

The experiments given above to obtain an idea of the sensitivity of the eye were repeated using small amounts of fabric, factors which markedly affect spectral reflection values.

The experiments given above to obtain an idea of the of red dye alone on white wool fabrics and also small amounts of violet dye alone on white wool. Small amounts of the violet were likewise dyed along with 1% of the yellow. It was found that smaller amounts of red or violet dye could be detected on the white wool than on wool dyed simultaneously with yellow. Although no attempt will be made here to give all the data, they all pointed to the same conclusion; namely, that the naked eye can definitely appreciate differences in the color of dyed fabrics which correspond to reflection differences of only approximately 0.01%. It must be remembered in this discussion that the naked eye can not appreciate such small differences of color when they are caused by using very slightly different amounts of *exactly the same sample of one dye alone.*

It can not be too strongly emphasized that the most characteristic property of a chemically pure dye, that property which most certainly identifies a dye from other dyes, is the spectral absorption curve of the dye in a standard kind of solution under standard conditions. For this reason, the best and most certain method to characterize any dye in distinction from other dyes is to give its spectral absorption curve. As a matter of fact, although the whole curve is best, a few characteristic points on the curve, especially the absorption values at the maxima and minima of absorption, are sufficient for certain identification. Therefore, as a method of identification of dyes, there is no question but what the spectrophotometer is by far the best for chemically pure samples. And usually, if the dye is not pure, it can first be purified by chemical means. For these reasons, spectral obsorption curves are of value in research in the field of dyes for characterizing dyes for patent purposes and for the identification of unknown and strange dyes by comparison with dyes which can be built up in the laboratory from known intermediates to have a known structure. Where chemical tests fail, the spectrophotometer must always be the final and most certain authority for the identification of purified dyes. Also, one of the best methods to determine the course of purification of a dye is by the spectrophotometric method. When successive purifications cause no further change in the spectral absorption curve of the dye, then it is certain that all colored impurities have been removed. Sometimes, on the other hand, it is valuable to be able to separate and identify the colored impurities themselves. The spectral method is much more accurate for the determination of the simpler colored impurities in dyes than the capillary test with filter paper.

One of the things a selling organization in the dyestuffs business must do every day is to identify a number of unknown products, often mixtures, which have been offered or sold to dye consumers by competitors. One might think from what has been said, that a spectrophotometer would be valuable for this purpose. It is true that a spectrophotometer may be used to advantage for this work when a particularly difficult problem is presented, as outlined above. Under ordinary circumstances, however, the man of experience in a few minutes can identify a dye or mixture of dyes by a few spotting tests of the dye blown out on wet filter paper, using a few common chemicals. Here again, we must be careful that we do not, in some instances, go to a longer method with the spectrophotometer when the identification can be made in a few seconds with a few spotting tests even when the sample is a mixture. On the other hand, when simple chemical tests fail, recourse *must* be had either to the spectrophotometric method or to the very long and difficult method of identification of the decomposition products from a complex dye.

An interesting field for investigation in which only a very little comparatively, has been done, is the correlation of structure with the spectral absorption curves of dyes in solution. Some of our research chemists in building up new dyes have found spectral absorption curves valuable and instructive in their work. These men file away both dyed swatches and spectral absorption curves along with the structural formulae of the dyes. The practical use of spectral absorption curves as an aid in devising new dyes, however, is in its infancy.

Those dyestuffs which are not used on fabrics but which are employed for coloring liquids, such as gasoline, or for coloring films and filters for photographic purposes, are most easily standardized entirely for shade and strength with spectral absorption curves. Here again it is usually sufficient merely to obtain absorption values only at the maxima and minima of the curves.

There are some, as for example those in the gasoline companies, who determine the strengths of dyes which are used in solution by means of a Duboscq Colorimeter. Anyone knows, however, that when there is a slight difference in color, the strengths obtained with a colorimeter can easily vary by as much as 20 per cent, depending upon the depth of layer or upon the concentration used for comparison.

An interesting use of the spectrophotometer is for the study of dyeing rates, or rates of exhaustion of dyes on textiles. The spectrophotometric method offers the quickest and simplest means to determine the amount of color left in solution at regular intervals. This method is par-

(Continued on page 415)

Proceedings of the American Association of Textile Chemists and Colorists

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MEETING OF PIEDMONT SECTION, AT THE POINSETT HOTEL, GREENVILLE, S. C., SATURDAY, MAY 2, 1931, AT 8 P. M.

THE May meeting of the Piedmont Section of the A.A.T.C.C. was held at the Poinsett Hotel, Greenville, S. C., on Saturday, May 2, 1931, at 8 o'clock in the evening, the Chairman of the Section, Samuel L. Hayes, presiding.

Chairman: Samuel L. Hayes.

Chairman Hayes: I will briefly outline the program tonight. After we finish with the business part, that is, routine business, we will have some entertainment which has been secured by the local Committee, followed by Dr. Sumner's speech. After that, some more entertainment, and then we will have a speech by Mr. Purcell, and then the third part of the entertainment, after which we will take up the symposium on bleaching. And don't forget the last event of the evening. In accordance with our custom, it will be the drawing of the numbers from the hat, and there are three prizes tonight to the lucky winners. Only those, who are in the hall, at the time the numbers are called will receive the prizes. There will be no waiting. Unless you are inside the hall, you will just be out of luck. That's all.

The first thing—this Sectional Committee for this section had a meeting and there are two or three things which they asked me to present to the Section as a whole tonight. The first is an article in the April 27 issue of The American Dyestuff Reporter. It is possible that all of you have not read that. It came out a few days ago and I am going to read part of the proceedings of the Council Meeting which was held in Boston on Friday, March 20.

(Reading) "Professor Olney reported for himself and Dr. Scott, the Committee appointed at the last meeting, to submit a rotating schedule for annual meetings as follows:

"Suggested Schedule for the annual Meeting of the A. A. T. C. C.:

"1. The schedule of rotation for New England and the Middle Atlantic States shall be:

"Northern New England Section, New York Section, Rhode Island Section, Philadelphia Section.

"2. The schedule of rotation for the other sections shall be: South Central Section; Middle West Section; Piedmont Section.

"3. An annual meeting shall be held in some section of the second group every third year.

"4. On this basis, the schedule beginning with the year, 1930, will be as follows:

1930 South Central.

1931 Northern New England.
1932 New York.
1933 Middle West.
1934 Rhode Island.
1935 Philadelphia.
1936 Piedmont.
1937 Northern New England." and so.

"The report was accepted as a tentative schedule for the annual meetings to be definitely acted upon at a subsequent meeting."

The Section Committee this afternoon requested me to read that to this Section tonight and to explain what it means. It simply means that the Piedmont Section would receive an annual meeting every nine years, and as Dick Mitchell says, if the meeting should be held in Charlotte one year, one of those nine years, and in Greensboro one, and Greenville one, it would mean that about every twenty-seven years one of these cities would get an annual meeting, which means a whole lot of us wouldn't be here. That is probably why Dick is so interested.

The Sectional Committee would like to have the Section instruct their secretary to send a letter of protest against that schedule. At the Greensboro meeting it was unanimously decided that the Piedmont Section would request an annual meeting in 1932. 1933 has already been given to Chicago. According to this, our next meeting would be in 1936. The Committee feels that a protest should be made due to the fact that the Piedmont Section is not receiving due consideration in proportion to the number of members and that it is not a fair allocation to wait until 1936. I will be glad to hear some discussion of this. Has any member any opinion to express along this line?

Dr. Mullins: Mr. President, that is exactly what we have been getting for some time, and if we let them get away with it, it will keep on.

Chairman Hayes: That is exactly what we do not want them to do.

Mr. Mitchell: I think we should make a determined effort to have them change that schedule and to let us have the meeting as it was understood it was going to be held. I came to this meeting representing 100 per cent attendance of Greensboro and vicinity of Greensboro to extend an invitation to come to Greensboro in 1932. The members are very anxious that they meet there at that time. We are so anxious, as a matter of fact, that some of the men took it upon themselves to take it up with the Chairman, and they gave me this (indicating paper) to take to the meeting which I have just handed to Mr. Thompson. With his permission, I am going to read it.

(Reading) "Greensboro Chamber of Commerce,
Greensboro, N. C., April 27, 1931.

"To Piedmont Section,
American Association of Textile Chemists and Colorists:
"Gentlemen: Attention: Mr. Thompson,
Secretary.

"Understanding that your national Association has decided to hold its next annual meeting in the Piedmont Section and that the question of which city in the Piedmont Section shall be recommended, is to be discussed at your Sectional meeting, Saturday, we advance the following considerations in support of holding the National meeting in Greensboro:

"1. Greensboro has almost ideal transportation facilities. Within a 12-hour night train ride 85% of your membership can be in Greensboro before 9 o'clock on the first day of the convention.

"2. Greensboro is strategically located to accommodate the great majority of delegates who will come by automobile.

"3. Greensboro hotels can accommodate 1,000 delegates in 'Class AAA' rooms, without upsetting normal business.

"4. Greensboro offers diversified recreational facilities of a high order. Three championship 18-hole golf courses and one 9-hole course—tennis, swimming, riding, etc.

"5. Greensboro is generally recognized as an ideal convention city. Since January 1st of this year we have entertained 75 conventions with 11,980 delegate days. We are, therefore, accustomed to handling convention mechanics which is an important factor in smooth and successful administration.

"6. We believe that more delegates will attend the convention if it is held in Greensboro than in any other city in the Piedmont—and in the last analysis is what makes a successful meeting. The overhead cost per delegate is lowered—Speakers respond better to larger audiences—Delegates have larger opportunity for renewing old contacts, and making new onces, etc.

"Our system of cooperating with association management to stimulate attendance has so pleased many associations in the past that they hold their meetings in Greensboro year after year.

"These facilities and this cooperation is offered to your Association together with our very warm, very hearty, and very sincere invitation to meet in Greensboro in 1932.

"Sincerely yours,
Earl Spence, Chairman, Convention Committee.
C. A. Hines, President, Chamber of Commerce.
E. L. Brownhill, President, Merchants Association.
R. R. King, Jr., Mayor."

You can see that every effort is being made to make this meeting, if it is held in Greensboro, a great success. I realize that there will be no action taken in the matter until December.

Chairman Hayes: I think the whole thing is that unless some Section makes a protest against this proposed schedule that it will undoubtedly be adopted. As I said a few minutes ago, the sectional committee this afternoon recommended that this Section tonight authorize the Sec-

retary to write a letter of protest and I feel that a motion is in order to so instruct the Secretary.

Member: I would like to move that we protest to the National Committee in regard to the arrangement for the meetings and that we ask that the Piedmont Section be given a meeting in rotation equally with any other Section.—(Motion seconded.)

Chairman Hayes: Any discussion? If not, those in favor of the motion will signify in the usual way by saying "aye"; opposed, no. The motion is carried.

At the Greensboro meeting it was decided that the floor would be open tonight for the representatives of any city to put in an invitation for the 1932 meeting, on the assumption that that meeting would come to the Piedmont Section. We have already heard from Greensboro and on behalf of this Section, I want to thank Mr. Mitchell for his invitation to Greensboro. Are there any other cities which would like to put in a bid? Mr. Stone put in a bid for Charlotte at the last meeting. I don't think it is necessary to put in a second one. This matter will probably not be decided until after the election of officers, assuming we get the meeting. I will wait just a minute in case any other city wants to put in a formal request or invitation for the 1932 meeting.

I have a letter here to Mr. Thompson, the secretary, which I will read to you:

"I note a notice of your spring meeting to be held May 2. I would like to suggest at this meeting to elect your member of the Nominating Committee for the National Association which, as you know, has to be elected before July 1. Probably your next meeting will be a little late. I would like to get this Committee functioning as soon as possible."

It is now in order for us to elect a member of the Nominating Committee. Each Section elects one member of the Nominating Committee who in turn selects the President and Vice-President, etc., and they are presented to the Association for the vote of the members as a whole. The Sectional Committee this afternoon recommended to this Section that Richard Mitchell, who was chairman last year, be put on this nominating committee. I will consider that as the nomination of Mr. Mitchell. It is open for nominations from the floor if any one wants to nominate any one else.

. . . Motion that nominations be closed is made and seconded. . . .

Chairman Hayes: In order to save time, I am going to ask all, who are in favor of Mr. Mitchell's election to this Committee, to say aye; opposed, no. Mr. Mitchell is elected. (Applause.) He must have been doing a little political work. (Laughter.)

Member: He doesn't need to.

Chairman Hayes: Mr. Mitchell is unanimously elected. Is Hugh Puckett in the room? I want a report from the Membership Committee.

Mr. Puckett: There is really not so much to report. We haven't had a meeting for one thing. I think we have sent in 5 names, including myself. I wasn't a member when you made me a member of this membership committee. (Laughter.)

Chairman Hayes: I think 5 is a very good number. I hope we will have a report of at least 10 new members before the next meeting. Is there any further business to come before the meeting?

Mr. Thompson: I would like to bring this to the attention of the members about getting the 1932 meeting here. In order to get it here, we have got to have as many members as it is possible for us to get. You say, why does that make any difference? Simply because of this, Mr. Barnes, who is a member of the Council, tells me that the applications for membership will be coming in from the various sections, much larger from the northern sections than from the Piedmont. The more members we have the more influence we will have. If we can get a large membership, in writing to the Council I can give that as a reason why the meeting should be held here in 1932. There are a lot here tonight who should be members and I expect you are interested. I want to say this about the reservation cards. There are a lot here tonight who did not make reservations and it is fortunate that the hotel was able to take care of you. Send in your reservation cards if you have any idea at all of coming. That will be especially important when the summer meeting comes along because they may not be able to enlarge on their plans at the last moment. If you will send in your reservation cards for the meeting, if you are planning on coming, it will help the meeting a great deal. One more thing, we had a ladies' night at the summer outing, and the Committee would like to know whether it is the opinion of this Section that it should be repeated, and whether or not a large number is coming?

Mr. Glenn: About the Membership Committee, I understand there are three members of the Membership Committee. I think there should be somebody working under that Committee, say, in Greensboro, and Charlotte, and Burlington, and Raleigh and different towns, to work under their instructions. There are a lot of men, I think, would join the organization if they were just asked and if you could get men at these different points, say 25 members under the Membership Committee to do that work, it would help. I know I find it difficult to get application blanks to give to folks.

Chairman Hayes: I think that suggestion an excellent one. I am going to ask Mr. Puckett to increase his committee to 10 or 12 so as to cover the Piedmont Section.

Mr. Glenn: I didn't mean new members of the Committee but men to work under the Committee.

Chairman Hayes: I have had a letter from Dr. Scott relative to the annual meeting in Boston and he has asked me to exert every effort to see that there is at least one paper presented in Boston next December from the Piedmont Section. It is a reasonable request. This Section ought to be ashamed of itself if it doesn't present one paper at the Boston meeting. I will try to call it to your attention later on but I will appreciate it if all of you will give that consideration. If any of you have a suggestion, a good suggestion, and can do a thing along that line, it will be appreciated.

The next meeting, according to the past custom, unless there is some other suggestion, will be held in Charlotte and will be along the line of the last several years, and will be held some Saturday in July. If there is no objection to that, the Sectional Committee will proceed in accordance with our past custom. That is all the business unless some member has some matter.

Mr. Thompson: I want to apologize to Jack Kellheffer for not mentioning his name in connection with the fine entertainment.

Mr. Thomas Marlow: It isn't a point of business but I have seen three or four gentlemen from the South Central Section and I would like to see them recognized.

Chairman Hayes: Will you introduce them.

Mr. Marlow: M. T. Johnson, L. L. Okey, S. H. Williams and perhaps others. I am glad to see them. (Applause.)

Mr. Glenn: Would it be out of order to suggest this: I was in Charlotte last year and it was so awfully hot there, would it be out of order that we go to the beach or mountains or to some cool, secluded spot?

Chairman Hayes: It is not out of order. I think it is in order. I have been told that they have had meetings in Asheville and once at the seashore but that the distance there was so great, the attendance was not so good. I can not say if that is right but that is my information. Your suggestion is in order. Any other comments along that line? Don't wait until the Sectional Committee sends it to Charlotte and then make the suggestion.

I want to thank Jack Kellheffer as I understand he is responsible for this entertainment. I didn't want to mention it until after all the entertainment but I will call on him now. (Applause.)

Mr. Kellheffer: We have a first class entertainment for you tonight and I think you all are going to enjoy it. The program is divided into three parts, and we will have the first part now. (Applause.)

. . . Entertainment . . .

Chairman Hayes: Before we begin now, I will be glad if everyone will sit down. That will take care of the entertainment by the girls. We will now pass on to the papers. Those of you, who were fortunate enough to be at the Greensboro meeting, will remember that Hill Hunter, of the Proximity Mills, gave us an excellent address on purchasing for the textile industry. At the time we secured Mr. Hunter, it was the plan of our officers to follow that at this meeting with a companion paper, "Selling to the Textile Industry." Mr. Hunter, more or less, persuaded us that it was a hard job to purchase for the textile industry. I understand that Dr. Sumner will show us tonight how easy it is to sell to the textile industry. I do not believe that the speaker needs any introduction. He, his company, and his southern representative are so well known that I really apologize for introducing him but purely as a matter of routine, I introduce Dr. R. E. Sumner, of the Calco Chemical Company.—(Applause.)

Selling to the Textile Industry

Dr. R. E. Sumner
Calco Chemical Co.

IT SEEMS that the first thing I will have to do is to explain this "doctor" business. I was out at Clemson the other day with some of the sustaining members and Professor Mullens introduced me as "Doctor." I protested that I was not a doctor, and he said: "The continental practice is that whoever walks through a dyehouse is a doctor"; so on that basis, I might be a doctor and this looks more or less like a medical convention to me.

I thought probably the thing that would interest most of you this evening on this selling proposition might be a few words on selling costs. After all is said and done, we begin to talk about costs, particularly under the present situation, in business generally. Costs are very unfortunate. Sales costs, as other costs, are naturally passed along to the buyer, and all of us eventually pay for them. First, we might as well start off by admitting that sales costs have not come down as fast as other costs which go into the goods. We have not duplicated mass production in the sales department of industries. It is equally true, however, that definite and important strides have been made in that direction in the last two decades. In any consideration of this type of problem, the first thing, which we should determine, is whether the general

methods that are in vogue are the ones best suited to our particular requirements. Probably the most radical departure that we could make from our present method of doing business would be to have traveling purchasing agents instead of traveling salesmen. Of course, during the war lots of purchasing agents did travel and probably a good many of you remember that they had a lot of difficulty in finding some one they could get accommodated by. That hardly seems possible but that did happen. But take the dyestuff industry as an example; it is obviously impracticable to do anything of that sort now. There are perhaps some 3,500 or 4,000 consumers of dyestuffs and about 50 to supply it, and that would not seem logical. So that method, I think, may be properly eliminated.

Another means of changing the business and the situation would be to do our business direct by mail. Of course, business in other lines have been built up on that basis to very large proportions. It is interesting to note, however, that the two concerns, who were foremost in that particular field, Sears Roebuck, and Montgomery Ward, have been rather busily engaged in the last few years in putting in retail stores. I think particularly in the sale of technical products, such as dyestuffs and finishing and bleaching materials, that there are very serious disadvantages to direct by mail work. Somehow or another we all seem to be constituted that way but it is a little difficult for the buyer to get down in black and white just what his problem is, and it is perhaps even more difficult for the seller to tell what his particular product is, and we seem to get farther along by talking it over.

My conslusion, I think, must be that under present conditions the general methods, which we are following, are probably best suited to our needs, namely: personal representation and solicitation. Let us first, therefore, look into the duties of the sales department, which will at the same time give us some idea of the reason for the selling costs. Obviously, the first, last and all the time job in the sales department is to get the well known and often elusive order. However, we have to do this on an economical basis. In order to accomplish these purposes, the sales department has several functions to perform. In the first place, they must know their market. One of the best known ways to waste sales money is to not know your markets. There are lots of concerns in the triple A-1 class who are not logical prospects for any given sales department, and very frequently you will find the sales departments falling down quite religiously in spite of this fact. Many times an account or territory is entirely illogical for a manufacturer to go after. Freight rates may rule you out automatically; and just the same way, we see, even now, sellers go into a market which is not at all logical for them. That is a fine way to waste a lot of sales money.

Purchasing departments have frequently been annoyed, to say the least, at the constant questions which they undoubtedly receive, whether you use this, that or the other product, and if so, how much. You know, unless you can get the sales organizations that are calling on you the answer to that, they are kind of sunk before they even get started. If all buyers would keep an accurate record of consumption and make this information available to all who may be considered sources of supply, they would substantially reduce selling costs.

The sales department must also provide an internal organization which will properly handle orders, to see that the goods are delivered when they are wanted and as they are wanted, and to see that the relations with the customer are handled in the most business-like fashion. The customer requires that this be done, and if this is not done, repeat orders are not forthcoming, and we all know, in the type of business we are interested in, that if we don't get repeat orders, we don't make any money.

In selling a technical item, it is the responsibility of the sales department to provide a competent technical organization to properly service their goods. You have got to spend a lot of time and a lot of money in finding out how their goods work, under what conditions they work and how they will fit particular needs and all that sort of thing. This is highly important both from the point of view of the seller as well as the buyer. It is obviously to the best interest of both to see that the goods, which are sold and purchased, work as efficiently as possible. So much for the general functions of the sales department and the reasons for some of its costs.

Now, for a more detailed examination of some of the items which go to make it up. The first and largest is that represented by salaries and expenses of salesmen and sales managers. These two items can hardly be separated. I think it is certainly the best thought on the subject today that sales management can do a whole lot better job out where the sales grow than parked behind some desk in a mahogony office. Most sales departments operate along this line, and it is almost impossible to separate the two costs. Second, of course, is the expense of the technical force, which we have just mentioned, and then again, the expense of the internal organization which is necessary to handle the general business operations of the company. All of these items are multiplied to some extent if branch offices are necessary, and you have to have a technical force, salesmen and an internal organization to take care of the business.

This selling game reminds me of a story which I heard not so long ago, which may amuse you. It seems that one Isadore Ginsberg was the proud owner of a race horse, and one of his friends finally talked him out of the race horse for $5,000. In due course, the check came in from Izzie's friend and he learned the same day that the race horse had died. Well, the $5,000 check looked awfully

good to him but he couldn't quite figure out what to do about it, but finally he deposited the check and shipped the race horse, dead as he was. Naturally, Izzie avoided his friend as much as possible for the next several weeks, but finally they were thrown together and they talked about the weather and other things. Izzie was getting on the anxious seat more and more and he finally turned to his friend, Moe, and said: "Moe, what about that race horse I shipped you? He was just a little sick when I shipped him." Moe replied that the race horse arrived but that when he arrived, he was a little bit dead. Izzie said: "That is too bad. I suppose I have got to give you back your $5,000." Moe replied: "Oh, no, I sold the horse." Izzie asked: "Sold the horse! What happened?" Moe said: "Well, I sold ten chances on the horse for $1,000.00 a piece,'" and Izzie inquired: "Didn't you have some dissatisfied customers?" Moe replied: "No, nobody kicked except the one who won, and I gave him his money back." (Laughter).

To get back to this question of sales costs again, to use the dyestuff industry as an example, probably $6,000,000 a year is the sales expense figure for the larger producing and importing groups, and when there is added to this the not insignificant total spent by jobbers, the gross amount comes under the head of substantial money. It is perfectly obvious that we do not need to spend over $6,000,000 a year to sell dyestuffs. However, we are operating in this country an industrial set-up which is competitive, and we can't have a competitive set-up without having a duplication of expense and a real duplication of expense. With all the faults of this set-up of industry, I think we have to admit it has more than paid its way. It has very largely contributed to lower costs and the general raising of our standards of living which has resulted from it. However, we can still maintain a competitive situation and not pay an expensive price for it. I think that for the past 20 years and particularly for the past 10 years that industry, not only in the lines in which we are particularly interested but in all lines, has been taking the best way out. In other words, they have been combining small units into larger units, and wherever this is done, it means very definite economy not only in the sales force but in every other type of force.

As we have said before, the sales department expense is very largely made up of salaries and expenses of personnel. What can we do to to cut down costs in this direction? There are two major items of costs under this heading about which something can be done to help; one is the selection of personnel and the other is in effectively using the time of the personnel after it has been selected. Sales work is an extremely personal proposition quite irrespective of what you have to sell. The important fact is what we, for the want of a better term, call personality. It is very difficult, in fact, almost impossible, to define just what we mean by this term. It includes a man's intelligence, his training, his ability to get along with people, his force of character, and so on, and it is because we have no proper yardstick by which to measure this in advance that a lot of sales money is wasted. Of course, as we all know, a great deal is spent to train men for a technical line of goods which they are going to sell, and we can't tell ahead of time whether a man is going to make a go of it or not. You spend the money and if he doesn't make a go of it, that money is just gone. There have been lots and lots of tests and theories and isms of one sort or another which various people have devised to bridge this gap. I don't think any of them have been too successful. I haven't known of any. During the war we had these intelligence tests, and a great many business institutions installed those and used them religiously. I think there are now very few of them who are still doing it. There have always been a lot of theories so far as salesmen are concerned, whether a man had a certain number of bumps on a certain spot on his head, etc. However, none of these seem to fill the bill. One of the large companies, a company out of our field entirely, employed about five or six hundred salesmen and once divided their salesmen into three classifications: the ones they knew were good because of their records, the ones that were fairly good, and those that were not so good. They tried to devise a questionnaire so that the answers which were gotten from the questionnaire, would reflect what preferences the good ones had that the poor ones did not have. Well, the two things seemed to be this: all the good salesmen or a substantial portion of them liked baseball, not to play it necessarily but to see it, and those in the third group were not interested in baseball. They also found that the men in the first group didn't like to putter around the house and that the men in the third group thought that puttering around the house was fine business. One executive ran across this and thought he could find out about his sales organization and the surprising thing was in several instances it hit the nail right on the head. I know one of these men was recognized as being perhaps the best salesman of that particular organization and was asked whether he liked baseball, and he said that he did. Upon being asked whether he liked to putter around the house, his reply was that he didn't know the difference between the butt end and the business end of a screw driver.

Now, to come to the second point, that is, the use of salesmen's time most effectively. It is obviously very important that the salesman make the most of every contact he has with his customer. His time for seeing his customer is very limited. If a salesman goes into a prospect's office with his mind filled with generalities, I don't believe he is going to be able to make a very effective presentation of his selling. I think all of us, when we call on the

trade, ought to have something very definite in mind that we think will be of interest to the customer and as closely as possible, stick to it. In a territory like the southern territory, where the mills are pretty well scattered, it costs something, $10 to $20, I would say, to make a call, and obviously we want to make the most of that expenditure. The buyer can always be very helpful in utilizing a salesman's time. This question of keeping salesmen waiting—but I don't think much of that is being done now. There has been a great improvement in that matter. Anything that can be done to speed up seeing the men is just as important to the customer as to the sales organization. It saves money. There is one thing I think the buyer can very well carefully consider, and that is the question of the length of time it takes between the time he becomes interested in a particular product and the time that product actually gets into production in the mill. The sales cycle of any technical product is very long. It takes a long time to get tests. I, of course, realize that the customer has a lot of things to do except test our goods but that can be speeded up, and it will be just as good for the buyer as it is for the seller.

There is one other tale that may interest you people. Fortunately, the ethics in our particular line are good and are getting better all the time. This is the story of a chap who was trying to describe business ethics to one of his friends. He had great difficulty in explaining it, and finally he said to his friend: "I will tell you a story that happened to me the other day and that will define what I mean." He said: "You know I am in the clothing business down town, and a customer came into my store the other day, and I finally sold him a suit of clothes for $25.00. Now, there is where the question of ethics comes in: Should I tell my partner?" (Laughter.)

To bring this paper to a close, there is one thought I would like to place before you. It is not a new one but it seems to me that it does deserve more emphasis than it generally receives. The purchasing department, whether constituted as such, or whether somebody else in the organization does that work, and the sales departments and the men in them are the contact men of industry, and it seems to me that they have a more important contribution to make than simply on the one hand to buy goods as cheap as possible and on the other to sell them as high as possible. The old idea that these two departments are sworn enemies and are the principals in a warm vendetta is passing, and I think the quicker it is gotten rid of completely the better off we will be. Only the closest sort of co-operation between them can result in the potential savings which run into millions of dollars which those contact men can make. We know in our every day work that millions of dollars are saved simply by substituting one product for three, and it is only by the very close working together of the buyer and seller that this is at all possible. They can be responsible for the development of better and cheaper ways of doing today's job and can prepare their respective companies for it tomorrow.

In closing, I would say to the salesman: Know your goods, know your market, think in terms of your customers' requirements and think not only of to-day but of tomorrow; and to the buyers, I would say: the sales organizations, the suppliers of your goods are one of your friends and one of your finest assets, and the salesman is there to be used—use him. (Applause.)

* * * *

Chairman Hayes: If Mr. Sumner had only added to that, to tell the salesman to keep the prices down, I would still call him doctor.

A story is told of an insane asylum inmate who was looking out the window of the asylum, and this window overlooked the stable yard of this insane asylum. There was a man out in the stable yard loading a wagon with compost, fertilizer. The inmate kept asking him questions; finally, the man with the wagon got a little bit out of sorts, and the inmate asked him "What are you putting in that wagon?" He replied: "Compost, you damn fool." The inmate inquired: "What are you going to do with it?" and the man replied: "I am going to put it on my strawberries." "Huh," replied the inmate, "I put sugar and cream on mine, and they call me crazy." (Applause.) The point I make there is that some time ago when I suggested that we have a paper at Greensboro on purchasing and one at Greenville on selling, some of them told me they thought I was crazy. I thought I was starting something. However, I feel that the two papers have added a great deal to the technical literature for which this Association is responsible, and on behalf of this section I want to thank Dr. Sumner for his paper. I now turn the meeting over to Jack

Chairman Hayes: To go back once more to the Greensboro meeting, Mr. Hunter told us there about purchasing, and here Dr. Sumner has told us about selling, and it strikes me that both the man who purchases and the man who sells would be in one awful fix if we didn't have these mill men who made the money to buy. Our next paper is going to be presented by a mill man. I believe I am correct in saying that it is the first time the Piedmont Section, at any rate, has had a general paper on the subject of printing. It should be of interest to all of us. In the last two or three years the printing industry has made tremendous strides in South Carolina, and it is very fitting that this paper should be delivered in Greenville. I take great pleasure in calling on Mr. James Purcell who will present his paper.

Proceedings of the American Association of Textile Chemists and Colorists

Printing Textiles Fabrics

By **JAMES PURCELL**

BEFORE I get started on this paper, Dr. Sumner's talk here and his story brought to my mind an incident that happened sometime ago. A fellow, who was walking by an insane asylum, saw one of the inmates pushing a wheel barrow but instead of having it right side up, he had it upside down. He thought it was kind of funny, and he stopped and asked the man: "Why are you pushing the wheel barrow that way?" The inmate replied: "Why, that's the way I like to do it." He said, "Well, you have got it wrong. You are carrying it wrong side up. You ought to turn it over." "Oh, no," replied the inmate, "I tried it that way once and they filled it up on me." That is the way with salesmen. If you don't watch out for them, they will get you pretty well stocked up on things you can't use, and then you have to get rid of them. In my paper tonight, I have tried to bear in mind that a good many of the men in this Section are not connected with the printing industry. I have tried to outline this as carefully as possible and in such a manner as to have them understand and to give them some idea of the things we are up against in printing.

A question often raised to-day is how long will printing be in the demand it has been the past few years, and printers are quick to answer that it will continue indefinitely.

The two greatest factors in this belief are the bringing in of new seasonal styles and the adoption of fast colors. Shortly after the war the urge to get away from the drab shades made itself felt in the larger and more daring patterns. The practice of running a line of patterns for a year, and then holding over about half of them for the next year, was abolished, and complete lines were made up about three times a year. This gives a change for spring and summer running to the lighter, smaller patterns, and fall and winter to the larger patterns, together with darker dyed ground effects. The search for new ideas has been greatly stimulated and the continual change makes buying a pleasure.

The other factor is the general use of fast colors. The general prejudice against prints, because they washed out and faded with two or three launderings, has been overcome as the fast prints today will stand severe handling with little or no change.

The fast colors have been greatly developed during the past decade, and much credit must be given our American manufacturers for work done both in developing new colors and their constant effort to make the present ones simpler to handle. The development of color pastes, which dry out very slowly and so keep the strength more constant, and the newer mechanical processes for getting the color pastes into very fine suspension, thus making them much easier to dissolve and reduce, play an important factor in the widely increased use of these colors today.

In dyeing, all the cloth is immersed in the dyestuff, which is in liquid form, while in printing the dye, in paste form, is applied to the cloth in confined areas according to the pattern required. This is done by means of copper rollers on which the pattern, or if more than one color, the parts of the pattern, is engraved. These engraved rollers are grouped around the lower half of a large padded cylinder, under pressure, and the color is smeared over the copper rollers and into the engraving from small color boxes directly under these rollers by a furnisher roller or brush. The surplus color is then cleaned off by means of a steel blade, commonly called "doctor blades," which leaves color only in the engraved parts of the rollers. The cloth is forced into the engraving, while passing between the cushioned cylinder and copper rolls, because of the pressure between the two, and picks up the color left in the engraving.

The doctor blades must be sharpened and placed on the copper rollers so that all the color is cleaned off the surface of the roller and the engraved part filled to capacity, but with no surplus to flush over the outlines. This is taken care of by blades of different thickness and springiness with the edges filed to various tapering points, placed on the rollers at the angle required for the particular pattern to be printed, and this knowledge comes only through constant instruction and experience. The various effects and shades are obtained by the deepness of the engraving and the strength of color. The cloth is then dried directly on cans or in hot air driers.

The principal colors used in printing cotton are vats, basics and chrome alizarines. Direct and acid colors are seldom used because they must be applied in the paste form and there are no mordants which will fix them to the fiber so they will not wash out. In the past few years rapid fast colors and napthols have been added to the printing group with excellent success.

Vat colors added to gum pastes, chosen for their ability to hold up under alkalies, are dissolved in potassium carbonate and reduced with formaldehyde hydrosulphite. This smooth paste is printed on the cloth, dried carefully, aged with very moist steam for three or four minutes, washed and soaped thoroughly before the process is complete.

Aging plays an all-important factor in vat colors, as improperly aged colors may lose up to forty or fifty per cent of their tinctorial value. Ideal aging condition is to have the very moist steam at a temperature of about 214 degrees with facilities for taking away the gases generated by the contact of the hydrosulphite with the steam.

The heat from this reaction must be carefully watched as it can run up to a point where the color value is killed.

Basic colors are dissolved in acetic acid added to a paste made of starch, or starch and gum, formed into a color lake by the addition of tannic acid and then printed and dried. While aging helps to fix these colors, the fastest results are obtained by a prolonging steaming of three-quarters to an hour's time. These colors are used on materials where fastness to light is of little consequence, and the fastness to washing of secondary consideration.

Out of the large group of alizarine colors there are a few suitable for printing. The dissolved color is added to a starch thickener, and acetate of chrome added as a mordant. The color is then printed and dried and steamed in the same manner as the basic colors. When washed and dried, these colors form a group in between the basic and vat colors. They are used mostly for draperies, and while faster than the basic colors are not nearly as bright.

Neither the napthol or rapid fast colors are complete as a range, but they are used in conjunction with vat colors in order to give brighter reds and oranges and to cut costs a trifle.

The napthol salts are the brightest, but require a base of napthol prepare which must be padded onto the cloth before printing and thus requires an extra process. This is not practical for small open patterns containing only a small amount of the shades which can be obtained by these colors, but for combination of larger patterns having a goodly amount of the reds, oranges and black will give more brilliant results than any other type of color. While not necessary, these colors will stand a short steaming and may be used with vat colors for the shades which are lacking in this group. Care must also be taken in giving them a thorough washing to remove the prepare from the balance of the cloth.

The rapid fast colors are easier to handle as they do not require the prepare base, but they are not as bright as the napthols and there are so few of them, their range being limited to red, orange and blue, they must be used with other types of colors. They are used with vat colors, as a short steaming does not greatly affect them, but care must be taken in the engraving of patterns where combinations of rapid fast and vat colors are to be used, to see that the outlines do not overlap or touch, as one reacts against the other. Some of the alizarine group may be fixed by a three to four minute aging and the rapid fast reds, yellows and orange give much brighter effects than any similar colors in this group.

You may readily see that in printing the preparation of the color must be carefully watched, the actual application of the colors to the cloth is a science that requires much watching and careful training, and the fixation of the color to the fiber is no less important, if brilliancy of shade and color value, the great factor in keeping the cost to a minimum, are to be obtained. (Applause.)

Chairman Hayes: Are there any questions any one would like to ask Mr. Purcell? It seems to me that this paper on printing would bring out a good many questions. We will pause for just a minute to see if there are any questions to be asked Mr. Purcell. Any questions?

One of the members tonight, Mr. Purcell, stopped me outside and asked me if I would ask for him, you to explain in detail the exact function of the back gray of a blanket.

Mr. Purcell: I don't want to get into that too deep because it takes quite a while to bring out all the minor details. On a printing machine, as I said a few moments ago, there is a large cylinder, and in order to cushion it and make the cloth pick up the color from the engraved parts of the roller, it is cushioned. It is padded. The cushion is formed by a lapper. The lapping is put on to various thicknesses, usually about an inch thick. It is pretty costly because it runs to $3 or $4 a yard and has a very great tendency to wear down quickly because of the pressure. To overcome that there is put a blanket on top of the lapper. It is an endless blanket. There are several types. Some types are made from cotton, some from silk, and there is now coming more into use the cotton blanket which has a layer of vulcanized rubber on top of the cotton. This blanket is about 15 yards long and runs back of the machine. It is an endless blanket as rigged up so that the rollers can be adjusted so as to keep it at a constant tension. The colors getting on the sides of the blanket are a nuisance and have a tendency to dirty the cloth going through, so we have a back gray. It is simply a roll of gray that runs in between the blanket and the cloth to be printed. We always have it wider than the cloth itself and try to have it wider than the lapper, two or three strands around the machine, so the surplus color will get on the back gray and not on the blanket or the cloth being printed. The back gray is a cost that can't be overcome. You take them back and use them once or twice and they get hard from the paste. They have to be washed out and used over again. With the direct colors you can use them a number of times, when you are using the paste, and they can be bleached out and printed on, but with vat colors and the napthols it is very, very hard to reclaim them, so the general process is to run them as long as they will stand up and then sell them for what you can get for them.

Chairman Hayes: Are there any further questions for Mr. Purcell? Is Mr. Sirrine in the hall? I was informed that Mr. Sirrine wanted to have the floor for just a minute.

Member: Mr. Sirrine said this afternoon that he would like to talk for just a minute about the textile and knitting exposition of 1933. I am sorry he is not in the hall.

Chairman Hayes: We will now turn the meeting over to Jack Kellheffer.

Chairman Hayes: We come now to the final number on the program with the exception of the drawing of the three prizes. The next is a symposium on bleaching cotton fabrics. A request was sent in by one of the members that this symposium be held, and it should be productive of some very good and very interesting discussion. As outlined in the notice, the following methods will be discussed: Lime and Caustic Soda Boil with Chlorine Bleach; Single Caustic Boil followed by Chlorine Bleach; Double Caustic Boil followed by Chlorine Bleach; Desizing and Caustic Boil followed by Chlorine Bleach; Sodium Peroxide for Bleaching; Hydrogen Peroxide for Bleaching; and Special Compounds for Bleaching. That certainly opens up a wide field and the subject is open for discussion from the floor. Please bear in mind that your committee has not arranged any speakers on these subjects. What we are trying to foster is a discussion of a subject such as bleaching in general by the members of the Section. The question is open for discussion. I will be glad to hear from any one here on any of these topics or on all of them. I do not feel that we should be bound down to take them up in order. The whole general topic of bleaching is thrown open. When you get up please give your name, so it may enter into the proceedings. Has anyone here anything to say?

M. P. Johnson: I would like to ask if there is any method of determining from a sample of a bleached job whether it has been chlorined or peroxided?

Chairman Hayes: The question is whether it is possible to tell whether a piece of cotton, I presume, has been bleached with chlorine or hydrogen peroxide. Is there anyone here who will volunteer to answer that question? The Chairman doesn't want to do all the talking.

Dr. E. W. Pierce: There is a test in existence if a small trace of hyperchlorides remains in the goods. You can make a solution of tolidine in alcohol, very weak putting it on the goods, and you will get an orange spot surrounded by a blue ring. If an antichlor has been used, no chlorine is left in it but most people simply sour with acid and there is always a trace of it left in the goods which is shown by the fact that they turn pink in storage, due to the presence of aniline oil in the goods. That shows you that you very often have chlorine left in the goods. If you apply that test, you can determine it if there is a very small trace left in the goods.

Chairman Hayes: Do you mean by that free chlorine?

Dr. Pierce: Yes

Chairman Hayes: Does that answer your question?

Mr. Johnson: Yes, sir.

Mr. Ivy: May I ask Dr. Pierce a question? In the use of sour antichlor, is sulphur dioxide considered both an antichlor and hydrochlor?

Dr. Pierce: It will perform both services at once.

Chairman Hayes: The Chairman must say he is a little disappointed tonight.

Mr. Hiller: There is so much discussion on bleaching, chlorine against peroxide. Can anyone tell me what advantage one has over the other?

Chairman Hayes: What is your opinion?

Mr. Hiller: Chlorine bleach is better than peroxide.

Chairman Hayes: In what way?

Mr. Hiller: In all ways, in every way. I want to know if any one is dyeing vat colors on cotton which has been bleached in peroxide?

John Pickup: We bleach all vat colors in peroxide and have very good results.

Chairman Hayes: I think Mr. Hiller referred to piece good and not to yarn.

Mr. Hiller: Yes, sir.

Mr. Leper: We have tried it and can't do it successfully.

Chairman Hayes: Is it a fair question to ask you what the trouble is?

Mr. Leper: The main trouble we have is penetration. We can't get it to penetrate. We use penetrating oils after the bleach but are not successful. I was going to ask the same question.

Mr. Hiller: I would like to ask Mr. Purcell if he boils before using peroxide? and how much?

Mr. Purcell: The usual custom is to have the one boil. I found that on heavier goods and possibly the same type of goods Mr. ..... uses, broacloth and things like that, that peroxide will not bottom the goods in one boil. In fact, with two preliminary bleachings you even then run into trouble.

Mr. Leper: You couldn't afford to do that.

Mr. Hiller: Here is a peroxide man in the place. Maybe he can explain it.

Mr. Ivy: Mr. Purcell's question of giving two boils. How long a boil does he give it?

Mr. Purcell: Well, the question has been raised whether 6, 8 or 10 hours but I say 10 or 12 hours. That raises the question of costs on boiling, and that in the past few years has been brought up quite frequently. They say if you cut the boil down to 10 hours or 8 hours, you save considerable money. Most of the money spent in boiling is bringing the goods up to a boil. The peroxide is used entirely in the Allen type kier, and with an automatic control on it, or without the automatic control, after you get enough pressure, and let it run for 4 or 5 hours or 6 hours, you can cut the steam off entirely and let it boil and the pressure will probably drop from 18 pounds to 15 pounds in the next three hours, and all you do there is taking up a little more time. Your costs aren't any greater and your results are so much better that I can't

see the value of cutting down a couple of hours and taking a chance on goods that are not quite right.

Mr. Hiller: My question was about the two boils. Take it when you put your goods in—there are the goods —they are not desized—your boil gets thick and dirty. Do you give two short boils or have the second a cleaner, scouring solution, or do you give two, say, 8 or 10 hour boils?

Mr. Purcell: If you have the time to do it, the two extra hours on the first boil doesn't cost you anything.

Mr. Pickup: I would like to ask Mr. Purcell which is the best method of bleaching to reclaim the back grays. Would you give it a lime boil, or two boils caustic, or could you do it with peroxide?

Mr. Purcell: I can't do it with peroxide. One of the strong talking points is that it won't take out vat colors. You might find a lime boil in one plant out of twenty to-day. The usual method is the caustic, or the caustic and soda ash. If you want to, add some soda ash to it and then the chlorine for clearing up the goods.

Chairman Hayes: Is there any way of reclaiming the vat grays?

Mr. Purcell: I will tell you what I have done. I have run vat grays for a very short time and put them in the kier and cleared them up as much as possible in printing cretonnes.

Chairman Hayes: If you are not printing cretonnes, you are out of luck. I have a long list of men I am going to call on if they don't get up of their own accord. I feel that this subject of bleaching should bring forth a good many volunteers.

Dr. Pierce: I think I can start something for you. In the past two years, white goods sold quite satisfactorily and then they decided they would dye vat dyes on them in the following ways: pigment padding, reduced, continuous machine and jig dyeing, and in every case they found that the goods that had been giving perfect satisfaction as bleached refused to give level shades when dyed with vat dyes. The dyers got blamed unmercifully. In every case it would be traced back to the bleachery. There were crow feet, feathering and resists. Can you tell us how to get rid of it, and prevent the oxycellulose on the fiber? You would do a great favor to the dyeing industry to-day.

Chairman Hayes: You are not asking the chairman, are you? (Laughter.) I understand that question was asked of the Section? Does anyone in here volunteer to answer Dr. Pierce's question?

Mr. Gow: Does not the lining of the kiers help to eliminate crows-feet? Copenhagen blues, while there are some others, is one of the most offensive, and it has been found that the lining of the kier with burlap has helped out considerably in that line.

Chairman Hayes: Anyone else?

Mr. Leper: This crow foot you talk about, does it always come from the kier?

Chairman Hayes: There is a question.

Mr. Gow: It is possible at times that it comes from a rough roll in the water washers. If there is a drag somewhere there is a possible tendency to leave a rough mark or similar mark to give crows-feet. A great many times it has been where there is a slight crack or groove in the roller. As I said, most often such marks are found in the blues.

Chairman Hayes: Wouldn't that be caused by too much tension or slipping of the roller?

Mr. Hiller: Mr. Gow, why do you always find crow feet on the same side?

Mr. Gow: Mr. Hiller and I have had that similar trouble in an old bleachery in St. Louis. They entirely conform to one side and that is a problem that has got me stumped.

Mr. Hiller: If you don't lap your kier, you will get them; if you lap your kier, you won't get them.

Chairman Hayes: Always?

Mr. Hiller: Yes, sir.

Chairman Hayes: Does everybody here agree that lapping the kiers is a complete cure-all for crows-feet? (Nos.) I thought I would get a little support on that.

Mr. Heap: (Reporter could not hear distinctly but understood the following):— I suggest that you examine the rollers. Invariably, you can trace them to that source and not to the kier.

Mr. Parker: My experience has been that you can get them from a tight washer, any place that creates friction; a squeezer with too much friction on it—anything that will break your fabric, and in sulphur dyeing it is as likely to come on one side as on the other.

Mr. Hiller: You don't dye sulphur colors in a rope form?

Mr. Parker: It will cause crow-feet.

Mr. Hiller: It is impossible to dye a sulphur that has been bleached in rope form.

Mr. Purcell: Talking about these crow-feet and rope form, is there anybody here from Lyman tonight? Mr. Shanklin.

Mr. Heap: Speaking about the open boil, I don't know much about the soap and kier process, but I have been informed that the open kier process bottoms the goods. If that statement is correct, and you bleach them in the chamber of direct chlorine gas, and the goods will dye after that. Five or six hundred thousand yards that was done was almost perfect; in fact, there was about 2 or 3 per cent seconds in the entire lot.

Chairman Hayes: How long ago?

Mr. Heap: Five or six years.

Member: I don't think it will ever be done successfully with peroxide

Chairman Hayes: Does anybody here agree with Mr. Hiller that your crow-feet always come on one side? (Nos.) Do they come on the face or back?

Mr. Hiller: They are always to you as they come off the dyer.

Chairman Hayes: Maybe you don't see any other side? Has anyone here ever noticed the crow-feet on both sides of fabric in the same lot? Raise your hands if you have. Too many to count. I think that is a very interesting subject, and I think probably we can take it up later and more fully.

Mr. Purcell: I usually find them on the face. In twills, etc., the softer yarns are brought out to the face and that is why you usually notice it.

Member: On 64-60s we ran through. I can verify that statement in that we apparently had them only on one side on either a 10,000 or 20,000 yard lot.

Mr. Heap: I would like to ask if anyone has boiled any sulphur twills and successfully dyed them without streaks? I haven't tried it. It might work.

Chairman Hayes: Don't do it. Does anybody disagree with me on that? Has anyone dyed twills and dyed them sulphur colors and had any firsts? I suppose you mean vat?

Mr. Heap: I meant to say vat colors.

Chairman Hayes: Dr. Pierce, has your question been answered? What do you say about this two-sided proposition?

Dr. Pierce: We have generally only looked at the face of the goods. There has always been plenty of trouble on the face of the goods, and if it has been on the back, we didn't worry about that. I have another question; at a certain mill we were padding a mercerized broadcloth, the pigment padded with the blue; it came through the nips and would give the slightest indication of spots here and there that looked as if a liquid had been splashed on the goods. The box and the tank were well agitated; there was no possibility of a sediment; these spots were not very prominent; you could barely see them. The roll was bound up tightly; it took ten minutes on the jig to reduce the dye, and when unrolled every spot, that appeared before and was very light, was about five times the intensity, and three layers above and three layers below were white where the colors had been drawn to intensify that one spot. Has anyone ever observed anything like that and could you give any explanation of what would cause it?

Chairman Hayes: You have heard Dr. Pierce's statement. That is on the vat colors.

Mr. Heap: I find that same trouble on the very subject I was asking about just now, twills. I have taken those same goods back and reduced them on the jig and found those spots disappeared. In my case they were color spots of unreduced dye but I don't know whether that answers the question or not.

Mr. Thompson: I have seen cases where metallic soaps have been deposited on the goods and those spots showed up when those goods were dyed. They would show a lighter spot where the metallic soap had been deposited due to the formation of oxycellulose due to the fact that the metallic soap catalyzed the oxidizing influence of the bleach, whether peroxide or chlorine, and the oxycellulose spot did not absorb the vat colors.

Chairman Hayes: Have you had any experience along that line, Mr. Williams?

Mr. Williams: I have not.

Mr. Pickup: I would like to ask about the goods that have been dyed before bleaching. What is the best method in that case, yarn dyed?

Chairman Hayes: Mr. Pickup asks which is the best method of bleaching yarn dyed with vat colors, I presume; that is, cotton goods containing yarn dyed vat colors, the best method of bleaching? What is you idea, Mr. Pickup?

Mr. Pickup: I am at a loss to know which is the best. I have found that sodium peroxide is the cheapest. I like hydrogen peroxide because it gives us less trouble.

Chairman Hayes: Has any other member anything to say as to that. Anyone here who bleaches goods containing colored yarn stripes? Apparently not. What about Mr. Gunter?

Mr. Shanklin: We handle very few stripes.

Chairman Hayes: What about that, Mr. Leper? Can't you help us answer one? The question was as to the most efficient method of bleaching cotton goods contained yarn dyed stripes, died with vat colors.

Mr. Leper: Run them in the washer, and throw them in the kier and then right into the peroxide and wash them. I think that is the best. Other times, we don't steep them; we just let them go.

Chairman Hayes: How do you do it, Mr. Feindel?

Mr. Feindel: We treat generally by plain steep and the wash and give a chlorine bleach wash, then antichlor with SO_2 and in the case of some of the blues, if they are dyed with G. C. D., we sprinkle them with hydro.

Chairman Hayes: Dr. Mullens, can you tell us what the practice is abroad in that respect?

Dr. Mullens: In bleaching colored stripes—well, abroad they bottom lightly and bleach heavily; in other words, the Kieropon practice—about like the English and Continental. They used no peroxide abroad until recently. I know they were quite interested in it. I have been asked more questions about peroxide abroad than upon any other bleaching subject. They can't quite believe we use it over here on a commercial scale. In this country most all men know Kieropon has been used quite a bit. There are only two ways, peroxide and Kieropon. At

school we use both methods. We did some work the other day with peroxide and got excellent results.

Mr. Haddock: * * * After all, there are only two ways of bleaching, run the liquid through the goods and the goods through the liquid. * * * If they are run through the machine in open form they can be evenly distributed and evenly dyed.

Mr. Heap: I beg to except to that. Mr. Haddock made the statement that goods can't be bleached without going through the liquor. Possibly so, but I have seen rigged up myself and worked on goods after lying in caustic overnight, 2-10 twills, and run them through two hot waters and cold water and into straight chlorine gas and I have obtained good results, and I got those goods and dyed them sulphur colors and I got better white than bleaching them in any liquor whatsoever. I would like to know if anyone here has done. The reason we stopped doing it, the rollers, after they had been running them, started a leak, and that is the only reason we stopped it.

Chairman Hayes: Did you try light shades?

Mr. Heap: I have no doubt the thing can be done for prints or anything else.

Mr. Haddock: This very good friend, I am glad he didn't object. He said he ran his goods through the liquid and not the liquid through the goods.

Mr. Heap: I could not get anyone interested to try a straight chlorine. I did these goods for $6 a day and I ran 40,000 yards a day. I sealed that chlorine in that chamber and that chlorine bleached those goods, or the oxygen that was forced out bleached the goods.

Member: Were those goods dry as they passed through the chlorine gas?

Mr. Heap: No.

Chairman Hayes: Was any alkali in the goods when they went through?

Mr. Heap: Yes, sir. I did it for $6.00 a day and it would cost six times that much in peroxide.

Chairman Hayes: Are there any questions to ask Mr. Heap about that?

Member: Why don't you do it today?

Mr. Heap: For the simple reason I can't get anyone interested in it. I still have in mind trying the process in some of these southern plants, and I believe that if they substituted chlorine for peroxide their troubles would end.

Dr. Mullens: What temperature did you use?

Mr. Heap: The cloth lay in boiling caustic overnight in order to partially bottom it. I understand to-day there is a continuous kier in effect that does bottom the goods. That being the case, to get your goods washed out, to get the waste matter washed out, you then run it through cold water and into the chlorine perfectly cold.

Dr. Mullens: I have no doubt that can be done. You could do that by padding on the hypochlorite.

Mr. Heap: The action of the hypochlorite is not sufficient to do it in a continuous manner. You take your sodium hypochlorite, it is not strong enough to do it in a continuous way. I claim by going in the straight chlorine gas an effect can be obtained that will be satisfactory.

Mr. Eddy: This method he speaks of was tried out probably 20 years ago. The theory is fine but practically, it never worked satisfactorily because you can't keep that chlorine in there. You can't put your goods through there and do it successfully day in and day out. You might have a successful day to-day but to-morrow will be another day.

Mr. Heap: I am still fighting on my pet hobby. I tried this out in Spring Hill Finishing Company. They had a man that came from another company who thought he had stolen the idea. They went to work and made the same mistake—they built in the air. If anyone went into the ground, provided there was no leaks, if it was built in the earth, I think it would work. If I tried it again, I would go down.

Mr. Crist: I would like to ask what was the temperature of the chamber in which the chlorine gas was?

Mr. Heap: The normal temperature of the room. I made up a chart there to show the density and that registered about two or three quarter pounds on this chart, and that chart regulated and showed you whether that tank was full of chlorine gas or not. In the morning when I started, I ran the gas in a little vent at the top. By the use of a little ammonia, I could tell when it was up. After that, we sailed right along.

Chairman Hayes: I hate to bring this to a close but there is going to be a dance here a little later. We have about three minutes more.

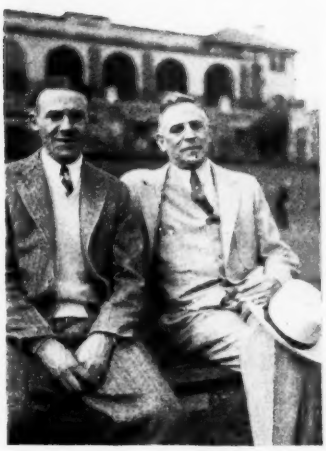
Mr. Glenn: I don't see how you let Sumner get by with all his talking and no argument. I think you ought to allow us about two minutes to ask him all the questions we want.

Chairman Hayes: I have one question to ask and that is, what has all this got to do with selling dyestuffs?

Mr. Sumner: My answer to Bob Glenn's question reminds me of a little story. A boy was trying to teach a dog some tricks and he wasn't making much headway with it. Finally, his dad came in the room and looked over the situation, and he was still making no headway. The father asked his son, "What are you trying to do?" and he said: "Daddy, I am trying to teach my dog some tricks." Whereupon, the father said: "Son, don't you know that you have got to know more than the dog to do that." (Applause.)

Chairman Hayes: I feel that this discussion here on bleaching has been very interesting. I think Mr. Heap brought up a subject worthy of discussion. The next meeting will be in Charlotte. If any of you men have some subjects which you would like to have discussed

Snapped at the Annual Outing of Northern New England Section



there along the same line, either send in your subject to Arthur Thompson or present it when you get there.

Mr. Prescott: If any members have any pet ideas that they want papers on for the next meeting or two, I suggest they send the subjects in to Arthur Thompson.

. . . Mr. Thompson conducts the drawing for the attendance prize winners, and prizes awarded . . .

Chairman Hayes: The meeting has about come to an end. Before we close I want to ask a rising vote of thanks to the speakers of the evening and to the local committee who have taken care of this meeting in such fine shape.

NORTHERN NEW ENGLAND SECTION OUTING

FORGETTING business and a week of rain, the Northern New England Section held one of its most successful outings, arranged by Walter H. Zillessen, at Andover Country Club, Shawsheen Village, Mass., on Friday, June 12. Following an afternoon of sports, 82 members and guests sat down to dinner in the club house.

The President's cup for low gross at golf went to Woodward Allen. For low net D. S. Clement, Gordon Thompson and George Stewart were tied. Visitors' cups went to F. J. Biery for low gross, and H. H. Holden for low net.

At tennis Charles Schmidt won the Chairman's cup, and Kingsbury and Bernard the doubles. Harry Finlay and Carl Schmetzler covered themselves with glory, and no little perspiration, at horseshoes.

Officers for next season will be Henry D. Grimes, chairman; John H. Grady, treasurer; Harold C. Chapin, secretary; Roland E. Derby, Clarence L. Nutting, Stephen W. Bastow, and William R. Moorhouse, sectional committee.

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary*.

MAY MEETING OF NEW YORK SECTION

THE May meeting of the New York Section of the American Association of Textile Chemists and Colorists was held at eight o'clock, Friday evening, May 22, 1931, at the Alexander Hamilton Hotel, Paterson, New Jersey, Chairman Robert H. Gaede presiding.

Chairman Gaede: If there is no objection, we will dispense with the reading of the minutes of the last meeting.

. . . The routine business of the Section was transacted . . .

Chairman Gaede: The program for tonight is an informal discussion of subjects which were covered in our earlier meetings where the time was too limited to permit complete discussion. If there are any questions on any subjects which we had during the year, or if there are any questions which anyone would want to ask on subjects which weren't covered, why, you are given an opportunity tonight to bring those questions up.

The Secretary has one question, I know. If there are any other questions that anyone wants to hand to the Secretary later or now, why, you are welcome to do so.

Secretary Hoppe: Here is a question: "Could anyone tell me how to determine quantitatively the amount of finish on a piece of tin phosphate silicate weighted silk?"

Chairman Gaede: If there is anyone that has any experience along that line, why, maybe they will be able to throw some light on it. I believe Mr. Otto handed in that question. Perhaps he could explain a little further what he means by that question.

Frederick E. Otto: I have tried to find out just how much finish there is on a tin weighted piece of silk. According to literature, all I could find out is to boil it for twenty minutes, rinse it for twenty minutes to half an hour and in that way the finish is removed. That is very true, but I also find that a good deal of the metallc weighting is removed also. It is pretty difficult to determine quantitatively the amount of finish on the piece. I was wondering if any of you had had any experience with that type of work.

Dr. Harold: The Bureau of Standards is ready to give you full information on that, if you will write to William D. Appel. They do nothing more nor less than quote Hermann's book, if you are familiar with it. They use a preliminary digestion with alcohol followed by soda, weak soda, and they call the differences brought about by those two agents, finish. If there is mineral loss, if there is phosphate silicate or tin loss, they don't seem to apprehend it. I don't know that there is.

Mr. Barbour: What is the percentage of weight they expect to gain in finishing such a piece of goods as Mr. Otto mentioned? What addition of weight is added to that piece of goods after it leaves the silicate?

Chairman Gaede: That is the question, to determine how much was on there.

Mr. Barbour: Now what does he put on when he does put the finish on?

A Voice: It ranges from three to fourteen per cent.

Mr. Barbour: A great deal will depend on the finish that is used, whether it be a fish glue or a composition of different stocks or what. That would determine the amount of weight that the piece will carry. Maybe I am talking foolishly among a lot of practical men. I would like to hear a number of practical men discuss it.

Chairman Gaede: The trouble seems to be that in weighting the silk, the weighting is impermanently fixed on there and will come off in hot water to a small extent, and most solvents will take off some of the weighting with it. It seems difficult to find a solvent or method of stripping off only the finish materials without taking off any of the weighting compound.

Mr. Barbour: Is it necessary to boil that fabric to remove that finish? Couldn't the water be at a temperature of 150 or 160 and with a certain period of soaking that could be removed, plus being washed in alcohol?

Mr. Otto: Well, I have tried the various temperatures and I have tried various finish removers and I find that in some cases by using a temperature of about fifty degrees centigrade, I do get at times the correct percentage using a piece of tin weighted goods that has been finished and I know just how much finish is on the piece. At times I get the correct percentage and at other times it is away off, using the same temperatures, the same concentration and the same finish remover. Of course there may be a way to explain that. One particular part of the piece may have absorbed more of the finish than another part. Still, it leaves me in doubt as to whether it is correct or not.

Mr. Chase: I should think it would be possible, knowing the composition at the start of the bath that you are using, to remove the finish, and after you have removed the finish, take the sample from the bath, evaporate the bath to dryness, ignite and weigh the residue. Your residue would be your weighting on the silk plus your known percentage of solids in your stripping bath. I have never done that but that sounds natural.

Chairman Gaede: Are there any further comments?

Mr. Barbour: In addition to your starches and glues, etc., that make up a finish, you have a certain percentage of oils, whether they be vegetable or mineral, that enter in. I would think—I don't know—but I would think that the rayon people would have some information on what a fabric will absorb in the ways of oils. I am a layman. I don't know anything about chemistry.

Chairman Gaede: I wonder if Dr. Carter could give us any information on that.

Dr. Carter: I don't see that there can be anything done except first the digestion extraction of the alcohol and then water extraction afterwards. You see, your alcohol extract contained your oil. Then the water would take out the gum and any gelatine. That is about all you would have in it. You wouldn't be putting a weighting finish on top of your tin weight.

Chairman Gaede: No, you wouldn't. Any other comments on this question? I guess we are ready for a second question that someone may have.

Mr. Herrmann: I don't know very much about the dressing of silk, the finishing or weighting of silk subsequent to the tinning, but there are many different substances that come into consideration. You might take the simplest one, sugar; another, gelatine; another different case in preparations, another different combinations of oil or in combination with lead salts, and so on in conjunction with paraffin. I don't see how water can be expected to take any of these off completely. I don't know how alcohol can be expected to remove the metallic elements. We find some of these combinations are eventually rather hygroscopic. So that part of the weight is in the form of an added four or five or six per cent of moisture. I think you are dealing with a rather complex condition, and if you don't know what the weighting agent is, it would be necessary first to determine what the agent is, and then you would be in a better position to subject it to a systematic analysis. It is just the same as if somebody gives you, say, a can full of some kind of a sizing compound and says "Well, tell me this or that about it," and you just go to work and extract the water without knowing what you are taking.

It is always a surprise to me to learn that there is as much as fourteen per cent of weight added on top of the tin. I didn't realize that there was that much. I thought that these weighting agents were all more or less to give improvement in the draping qualities or stiffness to handle, without attempting to get still more actual avoirdupois on it. What do you think of these combinations of oils and metallic salts or casein compounds rendered insoluble? I think if my friend would ask those things, he might lose the essence of the weight. The ash is probably the least important. There is a tremendous amount of volatile matter there that is added weight. Among the volatile substances might be water, glue, sugar, stuff that is combustible, and yet among the ash, the elements giving ash might be lead, magnesium, aluminum, sodium, not necessarily soluble parts of the original tin weighted piece.

Mr. Otto: What we are primarily interested in is not to find out just what the composition is on the piece but what we are after is how much is on it. I think the suggestion of burning, that is, evaporating it down and then burning it to find out whether there are any metallic salts present, as a very good one.

Mr. Chase: No doubt there would have to be adjustments.

Mr. Herrmann: What are you going to do? First strip the piece and weigh it and then you won't need to incinerate it, just evaporate it.

Mr. Chase: You would have to weigh it and then ash it. The difference between the weights of the total residue and the weight of the ash would be the weight of the organic matter which was used in finishing it.

Chairman Gaede: Are there any further comments? I guess we are ready now for the second question. Somebody surely had enough notice of this meeting and probably brought some questions with them, so we might as well have some good discussions on these.

Mr. Herrmann: There seems to be a lot of interest in finishes. I will ask one: I see a lot of delustered rayon. Does anyone know how it is being done? Is there such a thing as a finish which might be considered satisfactory that can be applied in the nature of a finish after dyeing, a

finish that would be under control as to the amount of luster that it leaves and that would stand a reasonable amount of washing and handling?

Chairman Gaede: There are a number of finish manufacturers who are putting out delustering finishes. Just what is in them, I don't know. I haven't analyzed them but there are some delustering finishes on the market.

Mr. Herrmann: Do they stand washing?

Chairman Gaede: That I couldn't say.

Mr. Herrmann: Don't chip or crack or dust off?

Chairman Gaede: I don't think they deluster it to the extent that is entirely satisfactory, but they have some delustering effect. Perhaps someone can tell us more about that.

Mr. Sokolinski: As I understand it, they will stand one or two washings. Some of them use Glauber's salt and then put the material in that and follow it up with barium chloride solution and precipitate the barium sulfate right in the fiber. But the real time for delustering is when the rayon is originally made. You have it precipitated right in the fiber. They have their own ways of doing that. It will, I understand, stand a few washes.

Mr. Herrmann: In the manufacture?

Mr. Sokolinski: Yes.

Mr. Herrmann: It struck me as peculiar. I happened to get a sample of rayon not long ago and it was of the deluster type. It was made by the manufacturer. He said: "I won't guarantee this stuff. We have had it for a couple of months." I don't know what the insinuation was, whether the stuff that had been put on it to deluster it was volatile or subject to fermentation.

Mr. Sokolinski: If it is really barium sulfate itself, I should think they would have to have something to have it adhere. If you precipitate it on the fibers, there is a lot more chance for it to be more stable.

Chairman Gaede: Dr. Coleman, can you give us an answer to that delustering question?

Dr. Coleman: Dr. Herrmann, your question was delustering applied in the finishing? I would say no. After the goods have been finished, there isn't such a thing as permanent delustering. After the first, second or third washing, there is nothing else to precipitate. Of course, the whole principle is barium, barium chloride, barium nitrate, the two-bath method. As far as I know, I haven't seen any product which produces a permanent deluster. The most effective method is in the finish.

Mr. Herrmann: There is a lot of trouble and inability to control your shade. It throws a veil of what I might call whitewash over the shade, and nobody can control it.

Dr. Coleman: It depends on the pigment you use. The principle is pigment or colloidal earth, but that problem hasn't been solved yet.

Chairman Gaede: Any further comments on delustering? Will anyone volunteer a third question?

Secretary Hoppe: Mr. Chairman, I have had another question handed me: "What is the action of caustic soda treatment on rayon?" Did everybody hear it? What is the action of the caustic soda treatment on rayon?

Chairman Gaede: That seems to be rather a broad question. You know that caustic soda has a beneficial action in that it causes more level dyeing, it strips off any sizing which may be on there and it causes a more level dyeing property of the rayon, especially where the rayon will dye up unevenly and become streaky in the filling or in the warp. Caustic soda will overcome a great deal of that difficulty. Has anyone else any remarks to make about that?

Mr. Barbour: Will caustic soda remove any kind of sizing?

Chairman Gaede: No. I dont think it will remove any kind.

Mr. Barbour: There are all kinds of sizing.

Dr. Coleman: I don't know very much about the action of caustic soda on rayon but it is done. Rayon crepe dyers use caustic soda. They use a cold caustic soda solution. They pass the goods through it for about ten or fifteen minutes cold. It is usually done before the goods are desized. They claim that it produces a certain effect that they are after. Another thing, it softens the rayon, too. Of course it can be overdone. You should either use a weak solution and a high temperature or up to eighty degrees cold. Some claim also that it delusters but I haven't seen that. They have treated rayon crepe at different temperatures and different strengths and they claimed the fiber actually changed in the caustic soda. I haven't seen it. Practically every rayon crepe dyer is using caustic soda solution. Some of them pass the goods through a caustic soda solution and wash the goods afterwards to remove the excess. Others wash the goods and add enough acid to neutralize the soda. Others wash it once or twice and dye the goods afterwards with some of the caustic soda left. They claim it causes level dyeing. It is used in dark shades, not so much in light shades.

Mr. Cohen: Dr. Coleman, is it true that caustic soda will strengthen the tensile strength of the goods or bring it together tighter?

Dr. Coleman: It brings the fibers together. It does not give it more tensile strength. It prevents it from shifting.

Secretary Hoppe: I understand the caustic treatment of rayon has a tendency to swell the rayon, making it more compact. Maybe that is what you are referring to? I don't know whether it does but I understand the caustic treatment does swell the rayon. It has a tendency to make it fuller. I don't speak from experience but I understand that is the action of the caustic soda treatment.

Chairman Gaede: Are there any further comments on this question?

Mr. Springer: I have a question while we are on the subject of rayon and caustic soda. There has been some discussion as regards the effect of caustic soda on cotton in the process of mercerization. There have been arguments pro and con, one saying that it is a chemical action and the other that it is a purely physical action. If rayon is treated with caustic soda, being a more open fiber, the cellulose being more open to attack, is it possible that caustic in weaker concentrations would be apt to affect the rayon similarly to the way a strong solution affects cotton? If rayon were treated with a more dilute solution of caustic—for example, I understand that mercerized cotton would require twenty per cent less of a vat dye stuff—would a similar reaction take place on rayon also previously treated with caustic?

Chairman Gaede: Can anyone answer Mr. Springer's question?

Mr. Miller: I should think that question could very easily be answered. Someone must know if rayon has been treated with caustic. Will it or will it not take up dyestuff more easily than an untreated piece? Personally, I don't know.

Chairman Gaede: It has been our experience, Mr. Miller, that the rayon treated with caustic does take less dyestuff.

Mr. Miller: To get the same shade?

Chairman Gaede: Yes. Now as to whether it is the same cause as in mercerized cotton, why, I suppose it is.

Mr. Cohen: Essentially, the rayon has already been treated with caustic. A large part of the change has already taken place and there can be some further change but not very much. That is why rayon has an increased affinity for dyestuffs either plain or mercerized. That probably answers a part of the question anyway.

Chairman Gaede: Does that answer your question, Mr. Springer?

Mr. Springer: That answers part of it but I imagine some experimentation would have to be done to find out exactly. As has been stated, rayon is a highly purified cellulose, that is, it is a great deal more purified than cotton. Therefore, we would expect it to take the dyestuff more readily and more deeply. Would it be advantageous to previously treat it with caustic as it is in some cases to mercerize cotton?

Chairman Gaede: As Dr. Coleman brought out, most dyers of rayon use caustic. It certainly appears that it is advantageous to do it. There seems to be some saving at least in the amount of dyestuff which is used for a certain shade and it has certain leveling properties and also shrinking qualities, which all combined is a very good reason for using caustic. Any further comments?

Mr. Chase: I know of at least two papers on that subject that have been presented before meetings of this society, not of this Section, I believe. One of them related strictly to the action of caustic on the various types of rayon, and I think that is one thing you must take into consideration, whether you are dealing with viscose, nitrocellulose or cuprammonium. That was covered very well two or three years ago at the annual meeting, where samples of rayon were treated with a number of different scouring agents of different degrees of alkalinity and then dyed and those samples were exhibited before the Association. By going back a couple of years in the files, anyone will be able to see that a great deal of work has been done on that subject. I don't remember the exact results.

Mr. Herrmann: Mr. Chairman, speaking only in a general way from my experience in the dyeing of rayon directly and indirectly, the use of caustic is usually associated with the necessity of doing a certain amount of preparing or cleaning. You are either opening the fiber or removing the size or trying to get at a knitting oil or cooking off some sort of weaving size of some kind, but I don't think that in the rayon dyeing there is a parallel to the mercerization treatment applied to cotton. There can't be. As far as I know, rayon can't be mercerized nor is it susceptible to a chemical reaction that can even be compared with mercerization. In a small way the fiber swells but you can't avail yourself of the lustering action which takes place on cotton under a great tension because of the tendency of the fiber to elongate, that is, if you apply tension, the fiber just loses its tension because it naturally elongates. I think it is correct that rayon has already in its very nature accomplished that greater affinity for dyestuff which can be transferred to cotton in the form of mercerization.

Personally, I believe that considerable of that increase of depth of color is more apparent than real. The mercerized cotton is somewhat opalescent, the eye penetrates into the interior and derives a greater color impression, and rayon, of course, is translucent. You might almost say it is transparent and it creates that same affect of color depth, simply due to the fact that you are viewing not merely the true surface but your eye actually penetrates and gets light which is reflected from the interior, right from the core of the yarn. Inasmuch as you have already achieved that in the very nature of rayon, you can't possibly add more to it. If anybody has any doubts on that, dye some of this silk called delustered rayon. You have lost opalescence, the affinity for dyestuff, you have obtained an opaque fiber and every shade looks chunky and thin, because you see only the color directly on the surface and you lose the color which is in the core of the yarn. Although caustic is probably of considerable importance for producing certain weaving effects, swelling, and possibly it is the cheapest scouring agent, cheapest method of preparing the material for dyeing, I don't con-

sider it in the same field at all with the treatment of cotton with caustic where you are really doing some chemical work on the fiber itself.

Mr. Chase: I might add a few more words to that. I dyed a great many thousands of yards of cotton fabrics containing rayon stripes or other effects in a piece that had been mercerized, and there was no apparent difference between rayon passed through the mercerized treatment and that that had not. I never made a close examination to see but if there was any increase in affinity for dyestuff, it was so slight that it was not noticeable to casual examination.

Mr. Stave: Getting back to treating rayon with caustic soda, I know many instances where it is not used for saving money on dyestuff but chiefly for softening the material, giving it a good soft handle. It is usually done right after the boiling off, before dyeing in many cases, on rayon crepes in particular. I am not talking about any other kind of material.

Chairman Gaede: Do you find that the rayon crepe can be dyed just as successfully with just the caustic treatment without a caustic and desizing treatment besides?

Mr. Stave: No. It is necessary to de-size it first and then the caustic soda is given as a special treatment just to soften the material before dyeing. That is what I believe it is used chiefly for, not so much for taking the sizing out of the rayon material but just for softening it and giving it a nice soft feel. I know many cases where it is just used for that, in all pastel shades in particular. It is not used particularly for saving money on dyestuffs.

Mr. Herrmann: Does it hurt the rayon?

Mr. Stave: No, it doesn't hurt the rayon at all. I know bringing the bath up to 180 degrees has no effect on the rayon at all other than giving the nice, soft feel to the rayon. We are talking about rayon crepes, of course.

Secretary Hoppe: In other words, it is just a scouring it really gets?

Mr. Stave: Just a little more than a scouring. I know it gives it that nice, soft feel.

Mr. Herrmann: Doesn't it kill the crepe?

Mr. Stave: No, it doesn't.

Mr. Herrmann: I should think it would take the spring or twist out of the yarn.

Mr. Stave: It is just treated for about ten minutes and I don't think it has a chance to harm the crepe in any way.

Mr. Springer: In reference to what Mr. Herrmann said before, I noticed a while ago there was an article in the *American Dyestuff Reporter* by Herman Boxser, reviewing the literature regarding the mercerization of cotton and also discussing the possibility of a chemical or physical reaction. At the end of the article, it stated that at the present time it has not been proven conclusively one way or the other whether the action was chemical or physical. Now, in the case of rayon, let's take, for example, Bemberg, because that is the simplest. In the manufacture of Bemberg, the cellulose is dissolved in an alkaline solution, then it is precipitated in an acid bath, I believe. We have practically pure cellulose. I don't think after its precipitation there is any alkali compound of the cellulose present. Therefore, I am under the impression that in the presence of the caustic, there would be the possibility of a further reaction similar to that in the mercerization of cotton, if there is a chemical reaction in the mercerization of cotton. If there is a chemical reaction there, it would seem to be natural that there would be in rayon. Then again, in the treatment with caustic, the greater affinity for dyestuff may be due to the swelling action. It does seem to swell more in caustic than it does in plain water. The point again arises, is this a permanent or temporary swelling? Does it produce the effect even after rinsing or is the effect eradicated with subsequent rinsing?

Mr. Knight: I would say it is very easy to prove the change in absorption of dyestuff, and I question very much if it has ever been a practical matter to show a like change in absorption of dyestuff between rayon treated with caustic and rayon not so treated. That would indicate you have a change in the case of the mercerized cotton, but you can't duplicate with the rayon. The viscose type goes through the same process as mercerization of cotton. I don't believe it has ever been made of practical value to treat rayon with caustic to show a saving of dyestuff. I have never heard of it.

Mr. Barbour: Answering the question that the gentleman asked, does it affect the twist, it will not affect the twist, only to increase the twist. It gives more life to the rayon.

Mr. Herrmann: You agree with me that you can't mercerize rayon?

Mr. Barbour: I am not a chemist and I can't discuss that.

Mr. Herrmann: Mercerization requires tension and rayon by itself is not capable of retaining tension.

Mr. Barbour: I see so much in a week of rayon samples that I wonder how these gentlemen sit around the table and don't have any experience.

Mr. Kennedy: Did Mr. Springer have reference to dyeing of flat colors? Was it his original idea to treat with caustic in order to increase the strength of the dyeing?

Mr. Springer: I wanted to know if there was a similar action in the case of rayon as there is in cotton, that is, if the treatment of rayon with caustic would give a substantial increase in depth with the same amount of dyestuff, because I know it does with cotton?

Chairman Gaede: As brought out here in this discussion, it seems as if it were not the case.

Mr. Kennedy: I think it all depends on the method of application, too, whether it has reference to being dyed in the piece or in the skein. Caustic soda wouldn't be necessary in some cases.

Chairman Gaede: It is an interesting subject. Now is the time to bring out any further questions on it.

Mr. Herrmann: There is one thing we don't want to lose track of, that mercerization is done cold under tension and all these caustic treatments have been referred to as being at 180 degrees. You don't mercerize there. It takes a cold, concentrated caustic solution to mercerize. When you take a weak caustic at 180 degrees, you are not mercerizing. You may swell the fiber, you may clean it and you may give it buoyancy and twist and crepe it. I don't think you could consider it as a parallel reaction. It is just different.

Dr. Coleman: I would like to add that it has been proven that caustic potash is better than caustic sodium, in fact, a much weaker solution is required than sodium. I know of cases where caustic potash is used. The sizes consist mainly of starch, glue and oil. The caustic soda kind of loosens up the size by attacking the starch, making the starch partly soluble, the glue being removed in the subsequent process of boiling off. The boiling off mainly consists of high temperature soda, any of the alkalis. The oil is emulsified in the boiling off. There is no question of the caustic soda leaving a sort of swelling effect on the fiber, but it is not the mere sizing it at all. I know of cases where the goods are boiled off first and then treated with caustic.

Mr. Carter: Some years ago I made quite a lot of experiments on a practical scale in mercerizing cotton goods with caustic soda and with caustic potash. We could see no difference between the result we got with caustic potash and that with caustic soda.

Chairman Gaede: You used the same amounts?

Mr. Carter: Chemically, the same amounts. We thought at that time caustic potash might give a rather better result, something that would warrant the increase of expense, but we didn't find anything.

Another matter comes to my mind. In the early days of rayon, we were dyeing some goods where there was a cotton warp and a rayon filler, and we had some differences in shades. We considered that and made up our minds that that was due to using rayon out of mixed lots. We found if we got our rayon out of one lot, that was overcome. I think that has been overcome now.

Mr. Springer: Regarding the action of caustic potash and soda on rayon, I think it has been proved experimentally in mercerizing cotton that caustic potash was less harmful to the rayon than caustic soda; in other words, it exerted a less swelling action on the cellulose acetate fiber, and if it were perfectly dry, it would tend to prevent that hydrolysis that would affect the cellulose acetate. If the period of immersion were limited to about sixty or ninety minutes, which would be sufficient for mercerization but insufficient for the harmful reaction to take place, a satisfactory effect would be obtained, that is, by substituting the caustic potash for the caustic soda, because they both have the mercerizing effect on the cotton and therefore the condition of the rayon is the only condition left to be considered.

Chairman Gaede: Are there any further questions on the subject of the treatment of rayons with caustic?

Here is a question which was just brought to my attention, which may be answered at our next meeting, at our outing: How may one cure a bad slice?

Are there any new questions anyone would like to ask? That is an old one.

Are there any questions concerning any previous meetings which we have had during the year that may have come to your minds since the meetings, or where there wasn't sufficient time allowed to discuss them?

(*Continued in next issue*)

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FACTS OR FANCIES

RECENTLY there appeared in one of the chemical trade journals in the field an editorial dealing with the recent tariff legislation. There has been considerable talk with regard to these comments and it is felt that certain salient points regarding the situation might well be mentioned on these pages.

In the first place, it might be well to bring attention to the fact that for the first nine months during which the Hawley-Smoot Tariff has been in effect, ending March 31, 1931, the total imports into this country amounted to $1,871,761,000.00 of which $1,301,101,000.00 came in duty free. In other words, 69.5% of the total importation into this country during this period were admitted without duty. In this connection, it might be added that such a percentage is not misplaced as it is often asserted because of a preponderance of free importations in certain schedules. As a matter of fact, in the case of textiles, out of total importations of $362,577,480, 60.1% of the imports came in duty free. In the case of metals and metal manufactures, out of total importations of $143,590,488, 69.6% came in duty free. Furthermore, in the case of the chemical schedule, out of the total imports of $73,484,682, 74% were admitted without duty.

The foreign trade of the United States, both in regard to exports and imports, declined appreciably during the year 1930 as compared with the previous twelve months if considered alone from the angle of *value*. In this connection, it is always advisable to bear in mind that comparisons of the foreign trade of the United States for 1930 and 1929 are often misconstrued, particularly those dealing with imports, because it is impossible to take the year 1929 as a reasonable average as a base year for such comparison.

Excepting for the moment these 1929-1930 comparisons of our foreign trade which have a decline of 28.4% for 1930 against the previous year, below will be found similar percentage declines in the foreign trade of ten other countries. Thus it would seem ungrounded to say that any decline in this country was due alone to foreign trade rather than a world-wide economic structure:—

Japan	31.2%	Australia	30.6
Chile	30.3	Brazil	28.9
Canada	23.7	British India	22.3%
Italy	20.2	United Kingdom	17.
Germany	16.8	France	12.2

A salient point which is all too frequently passed over or not considered is the fact that decreases in importations expressed in the terms of value may not alone be due to a fall in the price or unit value of the export or import fully as much as a decrease in the volume. This is especially applicable in speaking of raw materials which commodities are extremely sensitive to price fluctuation. Below are printed certain figures illustrative of this point:

IMPORTS INTO UNITED STATES, 1930, COMPARED WITH 1929

Crude Rubber:— Down 58.3% by value, but only 3.8% by volume.

1929	1,262,938,646 lbs.	$240,966,170
1930	1,089,829,613 lbs.	$140,641,134

Raw Silk:— Down 38.5% by value, but only 15.3% by volume.

1929	87,067,949 lbs.	$427,126,383
1930	73,733,278 lbs.	$262,912,729

Coffee:— Down 30.8% by value, but *up* 7.9% by volume.

1929	1,482,257,921 lbs.	$302,396,882
1930	1,599,316,553 lbs.	$209,471,802

EXPORTS FROM UNITED STATES, 1930, COMPARED WITH 1929

Cotton, Manufactured:— Down 35.6% in value but only 12.3% in volume.

1929	3,981,509,485 lbs.	$770,830,254
1930	3,492,233,934 lbs.	$496,737,512

Wheat:— Down 21.1% by value, but only 3.6% in volume.

1929	90,129,600 bu.	$111,500,615
1930	87,773,601 bu.	$ 88,092.528

It will be seen that the decrease in the value of these five commodities alone accounts for practically 25% of the decline in our 1930 foreign trade when compared to 1929 on the basis of value.

Often in newspaper discussions of the tariff situation, allusion is made to the fact that upwards of half a hundred nations have increased their tariffs since the Hawley-Smoot revision was effected; but, there is also something on the other side of the fence; for, between 1925 and 1928 (before this legislation was begun) thirty-four countries made eighty-four upward revisions in their tariff laws.

The feeling in the chemical industry is that it finds itself in a peculiar position. As a matter of fact, in the case of no other American industry is the need for adequate tariff rates so necessary from the economic and

national defense standpoint, that certain of its rates are applied on the basis of American valuation. The rates arrived at and incorporated in paragraphs 27 and 28 as well as the all-important feature of American valuation are absolutely necessary to the well-being of the industry of our country. It is always wise to examine criticism in that light of actual facts, figures, and experience. We believe that the sentiment of the industry can only be constructively arrived at through such intelligent means.

TECHNICAL GRADUATES

IT has been conservatively estimated that there are about 50,000 technically trained students who are graduating from colleges this June. This means that there will probably be the same number looking for employment. Under the existing economic conditions many of them will not be placed for some time. Consequently they will not be able to use their training to advantage.

An analysis of the present conditions may be of interest and lead to an answer to the question: "Should the present situation, after all, bring about such a curtailment in the engagement of technically trained men as exists at the present time?"

The factors which have, more than any others, led to the diminution in the demand for technically trained men are:

1. Necessity for curtailment on account of diminished profits.

2. Consolidations of independent concerns, and the closing of one or more plants of large companies operating a number of isolated units.

3. The feeling which still persists on the part of some officials that scientific control and research are popular and make a good impression on customers and therefore are all right when business is profitable but that after all they are non-essentials and should become one of the first avenues of curtailment.

On the other hand these following important factors are often overlooked:

1. In many instances the whole development of a business concern may have been the result of practically applied technical knowledge.

2. Strict chemical control is frequently the thing, which, above all others, makes it possible to turn out a satisfactory product at a sufficiently low cost to meet competition.

3. Scientific research, frequently of a chemical nature, is needed more during depression than at any other time, in order that costs may be cut down, that waste materials and by-products put to profitable use, or perhaps entirely new processes discovered, and additional products put upon the market.

During periods of lessened industrial activity, the natural tendency is to cut down on operating expenses. The two methods of accomplishing this end that are most frequently used seem to be to decrease advertising and to reduce the number of men on the payroll. Men engaged in actual production will, of course, not be needed in such large numbers as when production is at a maximum. But the number of men engaged in research and technical investigations should not be determined by the volume of business at any one time. Technical workers are engaged to increase the profits of the concern hiring them by proper application of their knowledge. Therefore, in a period of depression, when profits are low, the number of technical men engaged by a concern should not be reduced in a mistaken effort to reduce expenses, for it will probably be these men who will eventually find a better way of cutting operating costs.

Would it not be well for the textile and dyestuff industries, as well as others, to consider at this time the advisability of extending the strictly technical phases of their work, rather than adopting the policy of curtailing them? In many instances, recent college graduates might be taken on in relatively minor positions until such a time when they could be used to greater advantage elsewhere. A preliminary experience for a while as an ordinary hand in the works might, in many cases, prove to be the finishing touch of a scholastic training that would develop an invaluable superintendent or executive at critical times in the future.

COMMUNICATION

The following letter was received regarding "Objection to Group Insurance for Chemical Manufacturers" which appeared on page 384 of the June 8th, 1931, issue of the AMERICAN DYESTUFF REPORTER:

Newport Chemical Works, Inc.
Passaic, N. J., June 11, 1931.

American Dyestuff Reporter, New York City.

Gentlemen:

I should like to make a comment on the article having to do with some objections to group insurance for chemical manufacturers appearing in your issue of June 8th.

It so happens that our company was one of the very first to take out group insurance covering all of its employees. However, in our case it is the company who actually takes out the insurance, whereas the reading of the article in question would indicate that in the case being described it is the employees who take out and pay for the insurance. The company in that case simply is lending their name for purposes of grouping.

As I have stated in our case the company itself takes out the insurance covering all employees; the company pays the premium without deductions from wages or salaries. When an employee leaves the company or ceases his connection with it, his insurance is automatically cancelled. It is true there is no cash surrender value, but on the other hand the premiums are correspondingly low.

We think very highly of group insurance. We believe that our employees do likewise, and we are convinced that the benefits far outweigh the comparatively slight monetary loss occasioned by the cancellation of a policy once in a while.

Very truly yours,
(Signed) ELVIN H. KILLHEFFER, *Pres.*

Spectrophotometric Measurements in The Dyestuffs Industry

(Continued from page 392)

ticularly good for this purpose because 5 c.c. samples can be removed from a comparatively large volume, such as 800 or 1000 c.c., without appreciably changing the total volume of the dye liquor. By this method, quantitative studies can be made of the effect of pH, salt, temperature and retarding agents on dyeing rates.

It has been shown by Brode[4] and others that the spectrophotometer can be employed for the accurate determination of pH values with indications. Although the method will undoubtedly prove of value in research, especially in the study of the dissociation constants of indicators, I believe that the spectrophotometer will never find extensive practical use for the routine determination of pH values. When greater accuracy is desired than can be obtained by comparison with known buffers and indicators in a comparator, recourse will probably be had to electrometric measurements. Electrometric measurements of pH are quite simple for most people and they possess the advantage of being determinable in highly colored solutions in which indicators can not be employed.

There is a field of usefulness for spectrophotometric measurements from which I expect great things. I refer to the determination, by means of spectral reflection curves, of the degree of change undergone by dyed fabrics when subjected to destructive agencies, such as light and washing. One of the important functions of our laboratory is to determine and record the relative fastness properties of dyes to those various destructive agencies. In this work, when a change is barely perceptible to the eye, it is sufficient merely to say that the change is a trace. When there is a large loss of strength (by "strength" is meant depth of color, or amount of dye on the fabric) and more often when a change of hue accompanies the loss in strength, the total change in color is expressed by such indeterminate expressions as "appreciably," "much," and "very much,". A "much" one day may be "very much" to the same observer the next day when he happens to have indigestion. At present, when there is considerable change in a dyeing upon exposure to a certain destructive agency, the fastness rating of that dyeing in comparison with others of entirely different color is subject to much argument and confusion. For this work it would indeed be a distinct advantage to use spectral reflection curves to show the change upon exposure to a destructive agency. Of much greater value, however, would be a single numerical value which would express the perceptible number of color steps between the original and the exposed sample so that the relative fastness of different colors which made in different ways could be accurately compared.

There is no question with regard to the usefulness of numerical data for expressing the change of a color in perceptible color steps. I wonder, however, if we properly appreciate the magnitude of the task of obtaining the data for such determinations. From thirty to fifty fastness tests are made for one dye and the whole series of tests must be made not only for every product which the manufacturer puts on the market but also for every product which he has under consideration for the market. Now, the color of a dyed fabric is reasonably well determined only when the reflection data are as accurate as can be obtained under the best conditions, assuming that the effect of the structure of the cloth and the manner of illumination can be satisfactorily handled. To obtain such data at the present time and to make the necessary calculations would certainly require several hours for each fastness property. If an experienced man can record visual observations covering 30 to 50 fastness tests in an hour and a half, you can appreciate how impractical it would be to take several days for the same work merely to express the results numerically. If the time required to obtain spectral reflection curves accurately and to calculate the colors and the changes in color could be shortened by the use of automatic instruments to eight or ten minutes the dyestuffs industry would gladly adopt such automatic instruments. The very great accuracy required in the data to compete with direct visual observations, however, makes the task of an automatically recording spectrophotometer and an automatic calculator very difficult indeed.

May I close this paper with a plea that those who are interested in spectrophotometric measurements in color-using industries not expect too much from the use of a spectrophotometer. For example, the expert dyer, who knows both the fastness properties and the working properties of his dyes, can match shades, as it is called—or colors, if you are a physicist and object to the term "shade"—more quickly and satisfactorily by visual examination of his dyeings than he can with spectral reflection measurements. The expert can decide in a moment after looking at a dyeing what change to make in the formula. Also, by the use of north light, a daylight lamp and artificial light he can tell quickly if his dyeing matches the submitted sample of dyed goods under different kinds of illumination. Finally, it must be remembered that as a consequence of the fact that each dye has a characteristic reflection curve on a fabric as well as a characteristic absorption curve in solution, color matches can be made which match under different conditions of illumination only when the same dyes are employed for the match as

for the original. The use of spectral reflection curves does not make it any more possible to get a match for the sample which will match under all conditions if identical dyes are not employed.

[1] Draves, Am. Dyestuff Rptr., 17, 43 (1928).
[2] Holmes, Am. Dyestuff Rptr., 15, 247 (1926).
[3] Ind. Eng. Chem., 18, 627 (1926).
[4] Brode, J. Am. Chem. Soc., 46, 581.

Lowell Textile Institute Summer Course in Microscopy and Photomicroscopy

There will be offered this summer, in the Chemistry Department of the Lowell Textile Institute, a course in Microscopy and Photomicroscopy open to men engaged in the textile industry.

The course will consist of instruction in the manipulation and care of the microscope and its various lighting accessories, optical measurements, the use of polarized light in identifying fibers, the identification of starches, animal fibers, vegetable fibers, and rayons. A short course in the construction and use of photomicrographic apparatus will be included.

The laboratory work will parallel the class work. There is an opportunity for specialization in the laboratory in either microscopy or photomicroscopy. The Microscopy and Photomicroscopy Laboratory is well equipped with modern microscopes and other equipment of all kinds.

This course will begin on Monday, June 22nd, and will continue for three weeks. A class will be held each morning except Saturday from 10 to 11 and will be followed by two hours of laboratory work. The charge for the course is $30.00 per student.

The course may be taken by students of the Lowell Textile Institute for credit.

For information as to the course or for registration, address the Registrar, Lowell Textile Institute, Lowell, Mass. Registration should be completed by June 20th.

Formal Fast Blue B Conc

As a running mate to the well-known Formal Black G Conc., Geigy Company has introduced a new wash-fast dye in Formal Fast Blue B Conc. The new product is said to leave rayon piece goods in excellent condition after dyeing and after-treating with Formaldehyde. It is also claimed to give pure white discharges.

Chemical Trade in Canada

The U. S. Department of Commerce reports that chemical production in Canada during 1930 showed a decline of 12 per cent in value from the total for the preceding year, according to preliminary figures of the Dominion Bureau of Statistics of Ottawa. The output value in 1930 was $122,266,852 as compared with $138,545,221 in 1929. However, the 1930 total was only slightly below the corresponding value for 1928 and exceeding the average for the past five years by $1,379,159. Imports of chemicals and allied products totaled $36,785,050 during 1930 as against $40,131,178 in 1929 and $36,963,694 in 1928. Exports declined in value to $13,320,506 from $21,827,696 in 1929 and $18,356,645 in 1928.

Nickel Clad Steel Plate

The Lukens Steel Company of Coatsville, Pennsylvania, announce the introduction of Lukens Nickel Clad Steel Plate. It is a hot rolled plate made up of a layer of pure solid nickel and a heavier layer of high grade flange steel. The pure nickel is said to be actually bonded to the

Nickel Clad Steel Tank

steel in the hot rolling process. Among the machines for which it is believed suitable are: large piece goods reel machines, peroxide bleaching kiers, boiling out kiers (caustic soda), and pressure and vacuum dyeing kettles, i.e., for heavy plate construction where the price of the pure nickel would be prohibitive.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Having experience nearly twenty years Superintendent Bleaching, Mercerizing, etc. Reply to Box W-100, c/o American Dyestuff Reporter.

SOUTHERN ORGANIZATION

regularly doing business with the Textile Industry, wishes to communicate with experienced manufacturer or manufacturing organization familiar with the production of finishing materials, including soluble oils and softeners. Address: "S-O," c/o American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED

Large Dyestuff Manufacturing Organization will employ immediately experienced Naphthol expert. Write, giving full particulars. Box No. 677, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.